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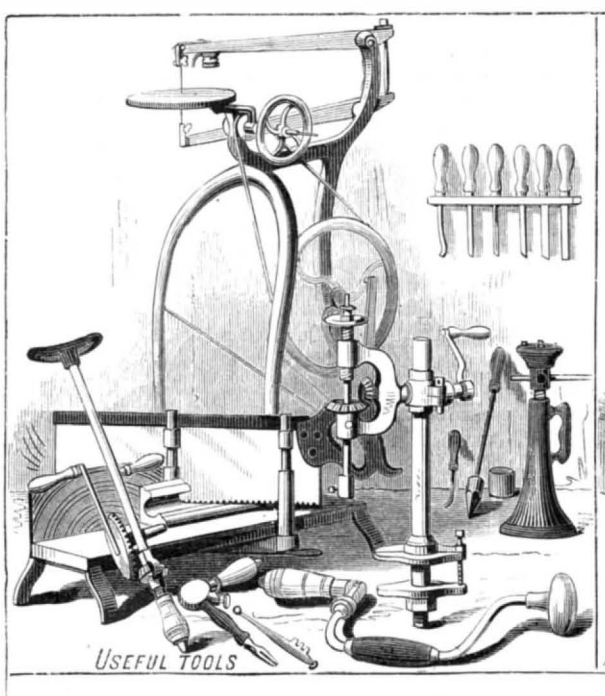
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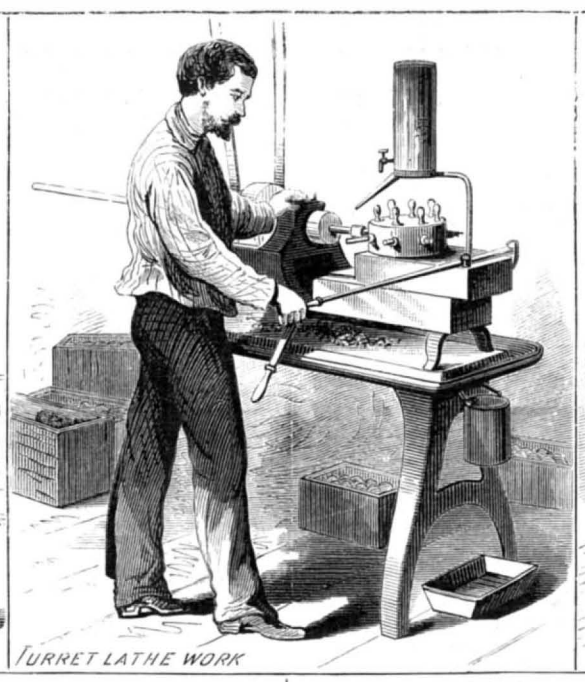
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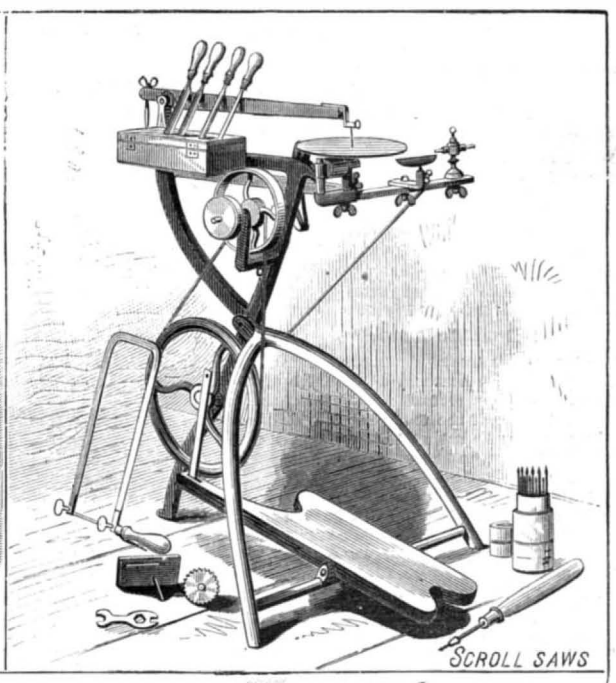
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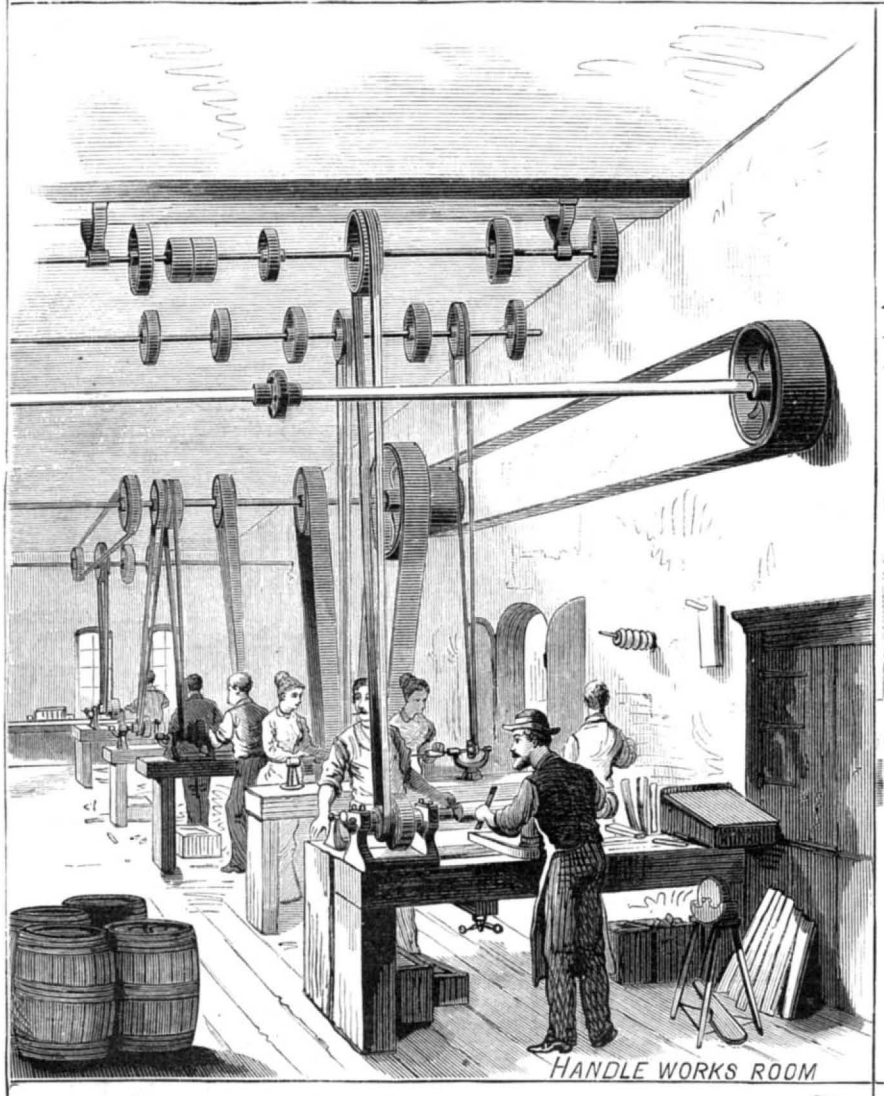
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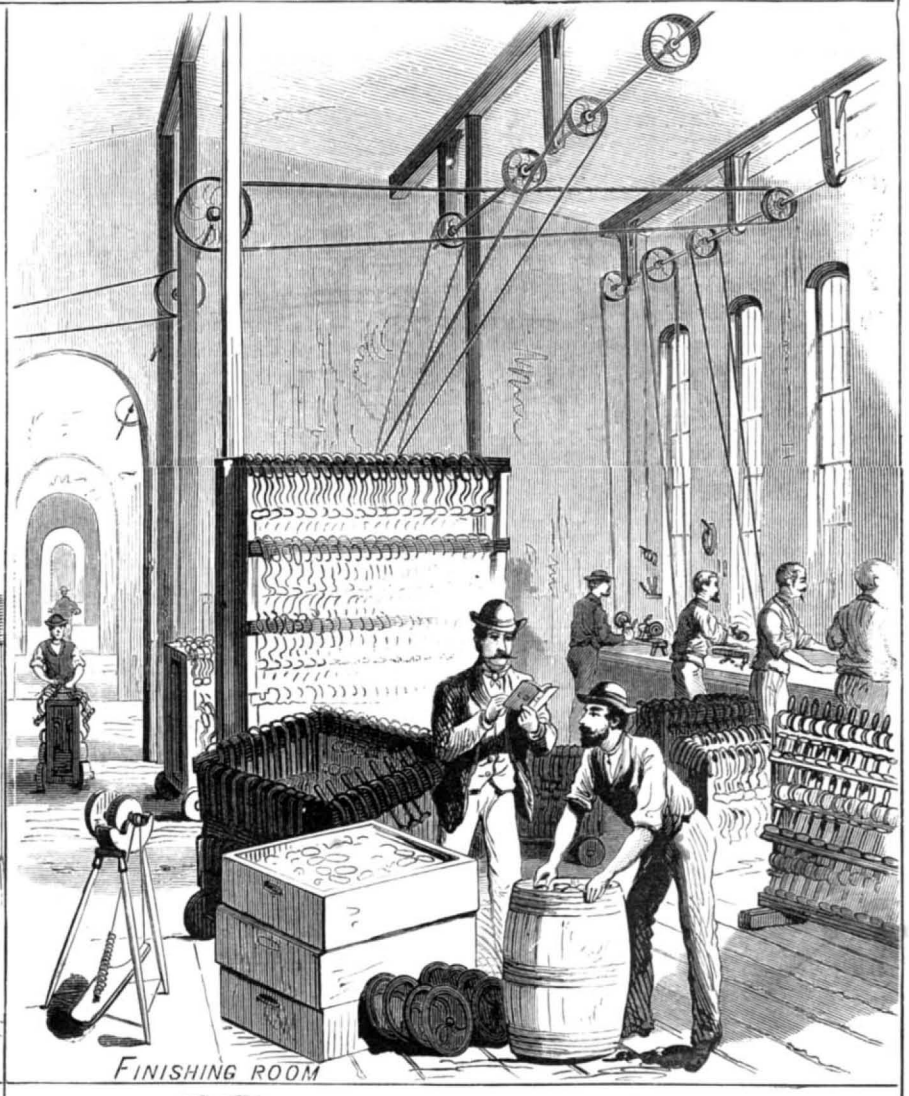
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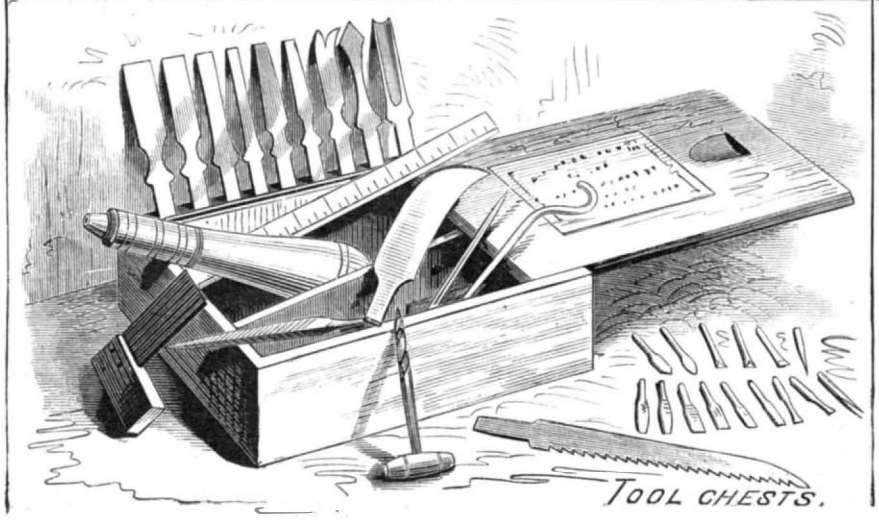
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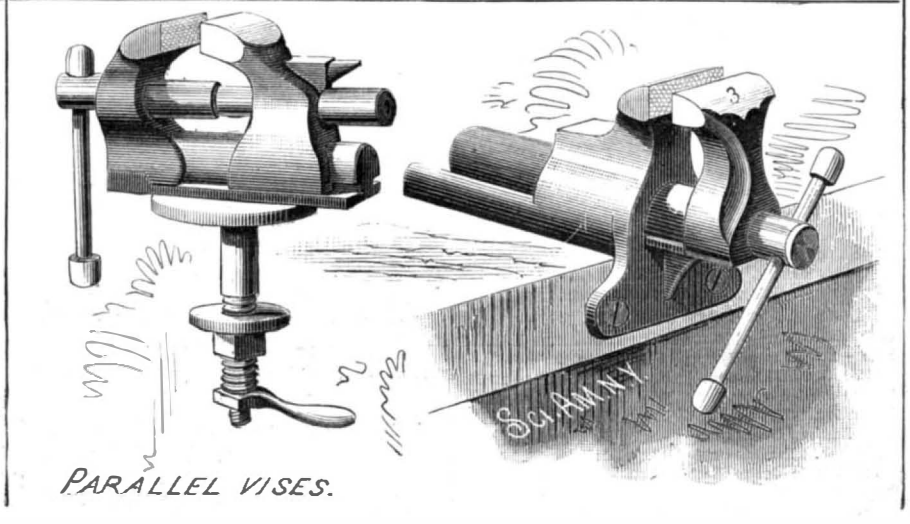
PARALLEL VISES.

THE MILLER'S FALLS TOOL WORKS.

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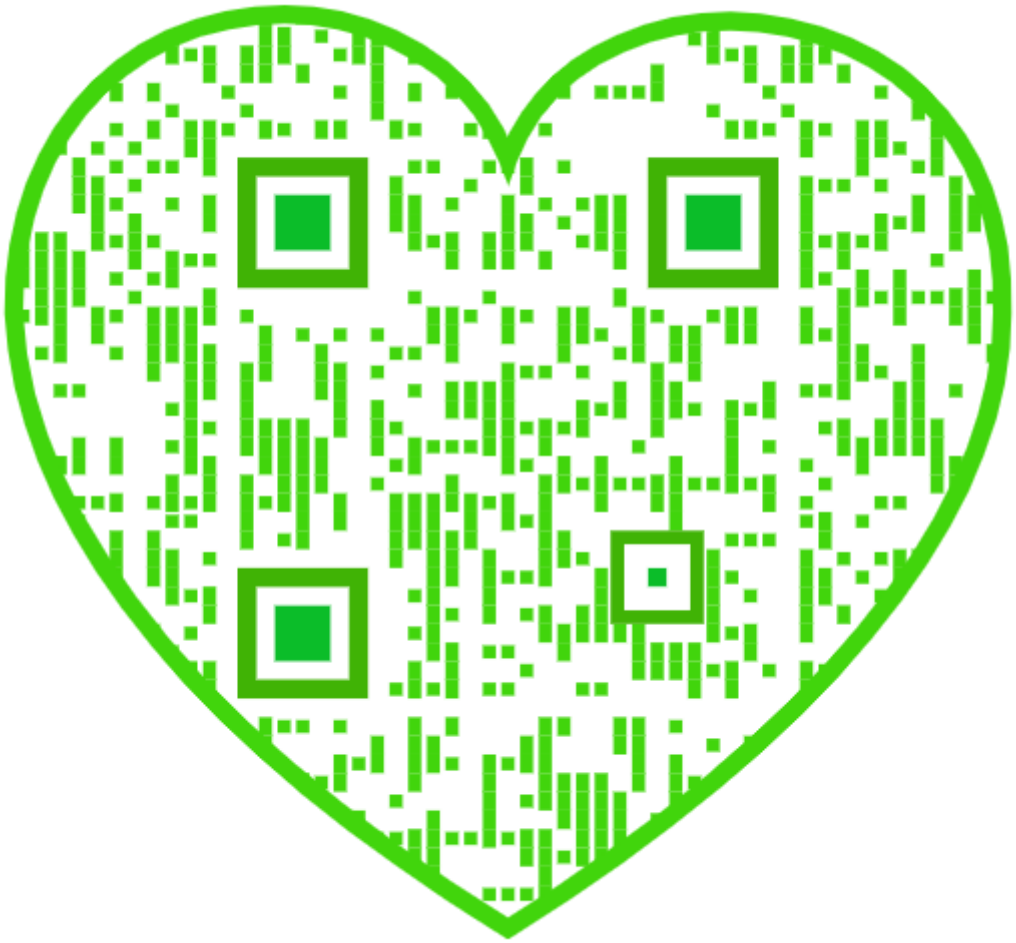

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NEW YORK, SATURDAY, MARCH 22, 1879.

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THE PATENT BILL DEFEATED.

The bill which threatened so much injury to the patent system (Senate Bill 300) was brought before the House, March 1, and failed to pass.

The industrial interests of the country have happily escaped an imminent peril; for a measure which involved so serious an invasion of the rights of a valuable species of property, to the discouragement of the class of men upon whose efforts our varied industries are chiefly founded, must have reacted disastrously upon the prosperity of all classes.

Accordingly the thanks, not only of inventors and manufacturers, but of the entire community, are due to the members of Congress who voted against the obnoxious measure, and still more to the thoughtful citizens throughout the land, whose multitudinous protests against the passage of the bill convinced Congress that the people were emphatically opposed to the threatened invasion of the rights of inventors.

The advocates of the measure attribute its failure in Congress very largely to the storm of communications which poured in upon the members during the last days of the session; an admission which inventors, and all who hold that the law should favor the patentee rather than the infringer, will do well to bear in mind. The same honorable and effective weapon of defense against the sophistries of powerful corporations—who are determined to mould the patent system in their own interest and against the just rights of inventors and small manufacturers—will assuredly be needed again.

The victory is but a temporary one. Those who are conspiring against the integrity of the patent system are as persistent as they are powerful and unscrupulous. Their agents in Washington and elsewhere are very adroit in covering their aims. While volubly asserting that their sole purpose is the removal of certain evils attending the administration of the patent law, whereby a few innocent farmers and others are made to suffer the consequences of their own indiscretion, the real object is to secure the virtual reversal of the fundamental spirit of the patent system, so as to give to a few combinations of wealthy railway and manufacturing corporations the practical control, on their own terms, of every invention which they may care to use.

There is good reason to believe that a new scheme, involving all the obnoxious features of the bill just defeated, will be pressed upon the incoming Congress; and unless prompt action is taken by the inventors and individual manufacturers of the country to make sure that their representatives in Congress are not left in ignorance of the practical merits of the questions at issue, there is danger that a skillfully worded bill may be pushed on to passage before the members discover its hidden purpose.

There is throughout the country a widespread and earnest feeling among inventors in favor of the formation of an Inventors' Guild, for the encouragement and defense of patentees. Concerted attack, it is said, should be met by concerted defense; and the inventors of the land are numerous enough to be exceedingly powerful, if they will only act together.

Possibly such an organization, properly sustained and officered, might be useful; but we are inclined to think that it is as individual citizens, insisting on their constitutional rights, that inventors can make their influence most beneficially felt. It is not possible for a properly instructed Congress to become the cat's-paw of anti-patent combinations. And if the inventors of the land will personally attend to the business of placing plainly and persistently before their representatives the questions of fact, justice, and sound policy involved in the preservation of the patent system substantially as it is, amending it only to give greater encouragement to inventors and fewer opportunities to infringers, the selfish aims of infringers' unions will surely be thwarted. The inventors have on their side justice and the support of all intelligent lovers of fair play. They are sure to win if they do not allow their case to fail through their own inaction. The hopeful experience of the past few weeks gives abundant reason to believe that indifference to their rights and interests is not a failing of inventors as a class.

MODEL TENEMENTS.

The problem of housing two or three hundred people to the acre securely, cheaply, and wholesomely, is one of vital importance in a city situated like New York.

The report of the Committee of Awards in the competition of designs for tenement houses, lately instituted by the *Plumber and Sanitary Engineer*, is chiefly valuable in the emphasis it gives to one point, namely, the impossibility of constructing an acceptable tenement house on one city lot, 25 x 100 feet, inclosed by buildings at the sides and in the rear.

The conditions to be met by the competitors were these: 1. Security against fire. 2. Distribution of light. 3. Ventilation. 4. Drainage and other sanitary appointments. 5. Seclusion of each suite and publicity of access. 6. Convenience of arrangements. 7. Inexpensiveness.

One hundred and ninety separate designs were sent in, representing all the leading cities of the United States, besides Canada, and London, England. Fifty-four were rather for apartment houses, with but one or two families on a floor, and were thrown out. Some provided for six families on a floor. The limit was fixed at four families. One plan gave only sixty-five rooms to thirty families.

While the plans to which prizes were given were considered by the committee to be improvements on the existing tenement, not one of them was without serious objections; the decision of the committee being that it is impossible to secure the requirements of physical and moral health within the narrow limits of one city lot.

The matter should not be allowed to rest here. Not only should the building of tenement houses on a single lot be prohibited, but a new test should be made as to the possibility of erecting light, safe, and wholesome tenement houses on two or more lots. Obviously it is not the circumstance that two or three hundred people are trying to live on each acre of land that makes our crowded city wards so unwholesome, but the fact that they are living badly under unfavorable conditions. The Windsor Hotel will house luxuriously five hundred people on two thirds of an acre, and then have an average of but one person to a room. Built in blocks of sufficient size, properly constructed and properly policed, our tenement houses might safely and securely shelter twice as many people to the acre as are now festering in unwholesomeness. And such houses would pay.

PROGRESS OF THE TELEPHONE.

We publish in another column a description of Professor Righi's telephone, made and tried last year at Bologna, Italy, which will be found especially interesting to electricians. It would appear that Professor Righi was not only one of the earliest to make a practical telephone, but his instrument has from the first given superior results. The sounds of the voice are transmitted with marvelous distinctness, are heard at a distance from the receiving instrument; and, in fact, many persons, even large audiences, at one end of a line may hear addresses, etc., made at the opposite end. This in itself is not new, as the Edison and Bell instruments have been used in the same manner. The Righi instrument has the special advantage that when once adjusted it continues to operate perfectly without readjustment for an indefinite period; this, we believe, cannot as yet be claimed for any of the other telephones.

The peculiarity of the new instrument is in transmitting the wave sounds through a diaphragm which rests upon a conducting substance made of a mixture of silver, reduced to an impalpable powder, and carbon, also very finely pulverized; the above devices being mounted or carried on the end of a slender spring. In principle the Righi telephone is similar to Edison's carbon telephone, and also to Hughes', which was based on Edison's. It would seem from the results obtained by the Righi telephone that it would be practicable for the Western Union Telegraph Company, or other corporation, to open a room is this city where the visitor might go, and by payment of a small fee sit and listen to the debates and proceedings of Congress. A wide and unbroken field for other uses of the telephone evidently awaits cultivation by enterprising and active individuals.

Professor Gray, we notice, has lately received a patent for a combination of a telephone with the ordinary Morse instrument, so that the telegrapher may communicate over the same line both by the Morse signals and also by the voice. By the use of the quadruplex instrument on such a line four messages may be transmitted by signals in the usual manner, while conversation may at the same time be carred on over the same wire, all without any interference of the different signals or systems. Thus there is added to the present telegraph system of the country an additional method of communication that promises to be highly promotive of the public convenience. Not only may we send the usual written signals to our friends, but we may also speak with them over the same wire; and the expert telegrapher, while he writes one set of messages with his hand, may, at the same time, send other sets of messages with his voice.

THE MENACE TO EUROPE.

We have been taught to look upon the return of the plague which devastated Europe repeatedly during the middle ages, and ceased its ravages in Europe only at the beginning of the present century, as a practical impossibility. In one epidemic five hundred years ago, when Europe was much less densely populated than now, it has been estimated that not less than 25,000,000 people perished. It was, indeed, a common thing in former ages for entire communities to be utterly wiped out of existence by this terrible pest. That could not happen now, it is said. Our modern physicians are better able to combat disease than were those of the past. Sanitary science has been developed, and effective quarantines are possible. Besides men are more intelligent now, and better fed, better housed, and more amenable to sanitary regulations. All of which is true; and we sincerely trust that the experience of the coming year will demonstrate the present impossibility of any widespread epidemic of the plague now filling Europe with alarm.

But Europe must not neglect to take account of conditions now prevailing in Western and Central Europe—indeed, all over the Continent—specially favorable to the development of an irresistible scourge, which may diminish the population of Europe by one-half within the next five years.

It must not be forgotten that the facilities for rapid communication characteristic of modern civilization may be a source of deadly peril in case of a disease so malignantly infectious as the plague. Nations are most intimately bound together by commerce, and every letter or bale of goods may be a means of transmitting infection. Victims of the disease may traverse the entire breadth of the Continent between the time of exposure and the full development of the

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disease. With every extension of the area of the plague the possibility of staying its advance by quarantine regulations becomes less, and after it passes a certain limit, pestilence, like fire, is uncontrollable. The supply of physicians and medicines at any time is adequate only for ordinary conditions; let the usual bounds of disease be much overpassed and resistance is hopeless. Such a state of things is by no means impossible in Europe to-day.

Consider the situation of affairs in Eastern Europe. Turkey is a chaos, and the military power which keeps a semblance of order there would soon break down with the plague in its camps. The local governments have neither the power nor the intelligence required to successfully combat an epidemic. The spread of the plague is little hindered by climatic conditions. Russia seems to be unable to stay its progress. The Russian people are already upon the brink of desperation and revolt through poverty and military oppression. Let the controlling arm of the government, the army, be paralyzed, as it is liable to be by the plague, and Russia will present scenes of disorder and death appalling to think of. On such food the plague fattens. The government would be blamed for every disaster, and mobs crazed by fear and revenge and hunger and blood would do their fatal work in every city. All who could command means of flight would fly, and carry the infection into adjoining lands in spite of the strictest sanitary regulations. Germany is almost ripe for revolution. Add to existing hard times and financial disorders the business derangements which precautions against contagion must entail, and a general lack of food and remunerative labor would necessarily ensue. Under such conditions, socialistic outbreaks would be inevitable. The experience of Russia would be repeated, and the steady advance of the plague over Western Europe would certainly follow. Once under way, the wave of death would sweep over Europe as surely and as destructively as it did in the fourteenth century.

Do we, therefore, predict a repetition of those terrible times? By no means. We have only shown that they are possible; that Europe presents conditions which, with plague upon its border, must be considered, to say the least, as decidedly menacing to the entire Continent, if not to the entire civilized world. If reports are true, and the plague is steadily approaching the heart of Russia, the promptest, most rigorous, and most thoroughgoing measures to stay its advance are imperatively needed. Indifference and inaction now will entail the most fearful consequences.

HOW THE PATENT BILL DIED.

The final action of the House of Representatives, in relation to the proposed amendment of the Patent Law, is reported in the *Congressional Record* for March 2, as follows:

"*Mr. Vance*—I am directed by the Committee on Patents to move to suspend the rules and pass the bill (S. No. 300) to amend the statutes in relation to patents and for other purposes, as amended by the House Committee on Patents."

[The bill as proposed to be amended was then read; the only notable change in the bill as printed January 24, appearing in section 12, the supplementary fees having been reduced by the House Committee from $50, at the end of four years, and $100, at the expiration of nine years, to $20 and $50, respectively.]

"*Mr. Garfield*—Is it proposed to pass the whole of this bill without the House having any opportunity to debate and consider it?

"*The Speaker*—The motion is to suspend the rules and pass the bill.

"*Mr. White, of Pennsylvania*—Does the bill not change our whole patent system?

"*The Speaker*—That is not a parliamentary question.

"*Mr. Rice, of Ohio*—I desire to ask whether this is the report of the Committee on Patents, and whether the bill as it has been read has the sanction of the committee.

"*Mr. Vance*—It has.

"*The Speaker*—The Chair is only recognizing gentlemen who have the authority of their committees to move to suspend the rules.

"*Mr. Keifer*—Will the gentleman from North Carolina not allow me to offer a single amendment to provide that the bill shall not be applicable to pending causes of action?

"*Mr. Vance*—I have not that authority.

"The question being taken on the motion to suspend the rules and pass the bill, there were—ayes, 67; noes, 79.

"*Mr. Vance*—I call for the yeas and nays.

"The question being taken on ordering the yeas and nays, there were ayes 26; not a sufficient number.

"*Mr. Townshend, of Illinois*—I call for tellers on the yeas and nays.

"Tellers were not ordered, only twenty-six members voting therefor.

"So the yeas and nays were not ordered, and two-thirds not voting in favor thereof, the rules were not suspended."

MR. ROBERT G. HATFIELD.

The architectural profession has lost one of its best known and most esteemed members in the death of Mr. R. G. Hatfield, of this city.

For many years Mr. Hatfield had been a prominent officer of the American Institute of Architecture, of which he was one of the founders, and also member of the American Society of Civil Engineers. His professional writings were numerous, "The American House Carpenter," published some thirty years ago, being among the earliest. A later and more important work on "The Theory of Transverse Strains, and its Application in the Construction of Buildings," enjoys the highest professional favor. His contributions to the SCIENTIFIC AMERICAN and other periodicals were many and valuable, his last, a very ingenious discussion of the origin and nature of the ancient structure known as the Old Mill at Newport, R. I., appearing in *Scribner's Monthly* on the day of his death.

As a constructor Mr. Hatfield was noted for superior knowledge and ability, and was much consulted by his professional brethren in difficult undertakings. The splendid arched iron roof of the Grand Central Railway Depot in this city is regarded not only as a model structure, but as a fine illustration of Mr. Hatfield's boldness and skill as a designer. Personally, Mr. Hatfield was greatly and justly esteemed by a wide circle of friends and acquaintances. His last public service was as Chairman of the Committee of Award in the competition of designs for model houses for workingmen, noticed in another column.

Gary's Alleged Neutral Line.

To the Editor of the Scientific American:

In an article upon "Gary's Motor," page 144, issue of March 8, the "behavior of the nail" is explained by its tendency to fly to the magnet upon approaching the same, but that in leaving the piece of sheet iron, the force of gravitation acts more strongly than the force of magnetic attraction, and the nail consequently falls to the ground. Having, by invitation, witnessed the nail experiment at Mr. Gary's room, I do not think the above theory is correct; inasmuch as the nail, when suspended from the sheet iron armature and at the distance of a few inches from the magnet, shows but little movement during the approach of the armature to the magnet; certainly not sufficient to cause its dislodgement by the force of gravitation. My own explanation, given to the exhibitor at the time of witnessing the experiment, is that the sheet iron armature, being polarized by the magnet, in turn polarizes the nail which is suspended from it, and that this polarity (of the nail) is necessarily reversed when brought within the direct control of the magnet, or sufficiently near thereto to be more powerfully affected by it than by the sheet iron (the power of which to increase its ability to control the nail, as they both approach the magnet, depends upon its thickness and area.)

Now, as the nail cannot have its polarity reversed and remain suspended from the sheet iron (by which it was originally polarized) throughout the process, by attraction, then, at the point of neutralization, the nail drops, without, of course, any change in polarity of the sheet iron armature, or the existence of any so-called "neutral line." M.

Boston, Mass., March 3, 1879.

AMERICAN INDUSTRIES.—No. 9.

SMALL TOOLS.

The industry under consideration is peculiarly American. It is representative of a class of establishments that have given our manufacturers a world-wide reputation for goods that are both cheap and reliable. This success is mainly due to the system of manufacture inaugurated here some years since, and which seems to thrive better in this country than anywhere else. But for the special machines, the system of inspection, and assembling we should still have the old-fashioned tools, with the defects consequent upon fitting one piece to another, and the prices would be far higher than the more perfect machine-made article now demands.

The Miller's Falls Company, of Miller's Falls, Mass., manufacture a great variety of useful tools, most of them being of the smaller sort, such as are of the most general utility. A few of these, shown in the title page engraving, will be recognized by most of our readers as familiar objects. Among these are breast drills, bench drills, Barber's bit brace, the ratchet brace, parallel vises, the miter box, the screw jack, all of which are so well known as to need no special description. The saw in the background of the left hand view is known as the Rogers scroll saw. It is a marvel of cheapness; the frame, of elegant design, is entirely of iron; the shaft, treadle motion, and drive wheel are well fitted, and the whole affair, while it is substantial and really good, is sold for $3. We mention the price as this machine exemplifies in a remarkable manner what has already been stated. In the upper right hand corner of the engraving is shown a Lester scroll saw, which combines a saw and a lathe; a hand scroll saw and a small drill are shown on the floor.

The two views in the lower part of the engraving represent two forms of parallel vise made by this company, also the well known tool chests which are used by both young and old.

The works of the Miller's Falls Company contain the most modern machinery for doing work rapidly and accurately. The middle view at the top of the engraving shows a turret lathe, one of the most useful tools for this kind of work.

The special use of the one shown is to make small universal chucks, such as are used with small lathes, hand drills, bit braces, etc. In five minutes from the time a bar of iron is put through the hollow mandrel of this lathe it is turned, drilled, tapped, chamfered, turned to the required form, and cut off.

Of the larger views, the right hand one represents the machinery for making various styles of tool handles; the left hand view represents the department in which the different kinds of tools are finished.

The main building of the works is divided into six compartments, separated from each other by heavy brick walls and iron doors, as a protection against the spread of fire. The works are complete in themselves, consisting of iron and brass foundries, blacksmith shops, a tempering shop, pattern, wood turning, machine, grinding, and polishing shops; inspection and stock rooms.

The machinery is driven by turbines having a total of 300 horse power. As an evidence of the success of this establishment it may be mentioned that great numbers of their tools are shipped to England, many of which go to Sheffield, which was once the very tool center of Europe.

The New York warerooms of the Miller's Falls Company are located at 74 Chambers street.

A GLASS MOUNTAIN AND ROAD.

Mr. P. W. Norris, the Superintendent of the Yellowstone National Park, on a recent visit to the capital gave a lecture on some of the natural curiosities of the region over which he presides and is engaged in exploring. Among these may be mentioned as the most novel a mountain of obsidian or volcanic glass, and a road made from this material.

Near the foot of Beaver Lake the explorers discovered this mountain of glass, which there rises in basalt-like columns and countless huge masses many hundreds of feet high from a hissing hot spring forming the margin of the lake, thus forming a barrier where it was very desirable that a wagon road should be, as the glass barricade sloped for some 300 feet high at an angle of 45° to the lake, and its glistening surface was therefore impassable, there being neither Indian nor game track over it. To make the road, huge fires were made against the glass to thoroughly heat and expand it, and then by dashing cold water from the lake against the heated glass suddenly cool the latter, causing large fragments to break from the mass, which were afterward broken up by sledges and picks, but not without severe lacerations of the hands and faces of the party, into smaller fragments, with which a wagon road one quarter of a mile long was constructed, about midway along the slope, thus making, it is believed, the only road of native glass upon the continent.

On reaching the Grand Cañon of the Gibbon river the explorers found the eastern palisade, for about two miles in length, to consist of vertical pillars, hundreds of feet high, of glistening black, yellow, mottled, or banded obsidian or volcanic glass.

This obsidian has been and is still used by the Indians for making arrow heads and other weapons and tools, and the mountain has formed a vast quarry for the making of such instruments or weapons of a quality and quantity unequaled elsewhere.

The lecturer gave a graphic description of "Old Faithful," and other geysers of Firehole Basin, and of the Liberty Cap and other geyser cones, resembling in their grotesque forms the monuments of an extinct race. He also exhibited a number of specimens of minerals found in the park, including chalcedony, amethysts, opals, petrified wood, lava, etc.

A SURPRISE TO MILLERS.

A decided sensation was caused in the United States Circuit Court at St. Louis, Mo., February 25th, during the trial of the great Middlings Purifier case. The American Consolidated Middlings Purifier Company had sued several St. Louis millers for infringement of patent and for damages, which, at the rate of three cents a barrel of flour, will amount to several millions of dollars. On the day named Mr. Rodney Mason, of Washington, leading counsel for the complainants, dismissed the suit against ex-Governor T. O. Stanard, Vice-President of the Millers' National Association, and T. B. M. Kehlor, of the Missouri State Association. The announcement carried dismay into the camp of the defendants, who had looked upon both men as among the staunchest of those engaged in the defense of the case. Ex-Governor Stanard was sued for $150,000, and he compromised by paying $900; Mr. Kehlor made an equally favorable arrangement.

The compromise was effected, it is said, against a written pledge of the two men with the other large millers of St. Louis to resist the complainants' claims. They have been thus associated for four years, and the combined defendants have spent over $100,000 in legal expenses.

SAFETY AT SEA.

At a special meeting of the American Geographical Society, February 27, Lieutenant J. B. M. Mason, of the United States Navy, gave an uncommonly instructive address on the means which inventors have devised, but which ship owners never furnish, for preventing loss of life in case of accident at sea. The address was abundantly illustrated with stereopticon views and life-saving apparatus. Very few, probably, of the large audience, were before aware of the existence of so many approved devices for preventing accident at sea, or for rescuing the victims of shipwreck; and very many of those who had been at sea must have felt the force of the Lieutenant's sarcastic description of the average traveler's anxiety for comfort and indifference with regard to the provisions made or neglected for securing safety. It is because of this happy-go-lucky spirit of travelers that it is possible to say, as Lieutenant Mason did, that there is not a single vessel sailing or steaming from this port or any other that is properly provided with life-saving apparatus.

Lieutenant Mason paid a handsome tribute to our Life Saving Stations as a useful and humane provision for saving life from wrecks on our coast.

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NEW VERTICAL FRENCH BURR MILLS.

We give herewith perspective and sectional views of a new vertical French burr mill, which is manufactured by Mr. C. K. Bullock, of 1357, 1359, and 1361 Bridge avenue, Philadelphia, Pa. This mill is adapted to all kinds of grinding, from ordinary feed to the heavy work of reducing gold quartz. It is particularly adapted to regrinding middlings and bran; and the manufacturers state that there is no work done by burrstones that this mill will not do satisfactorily.

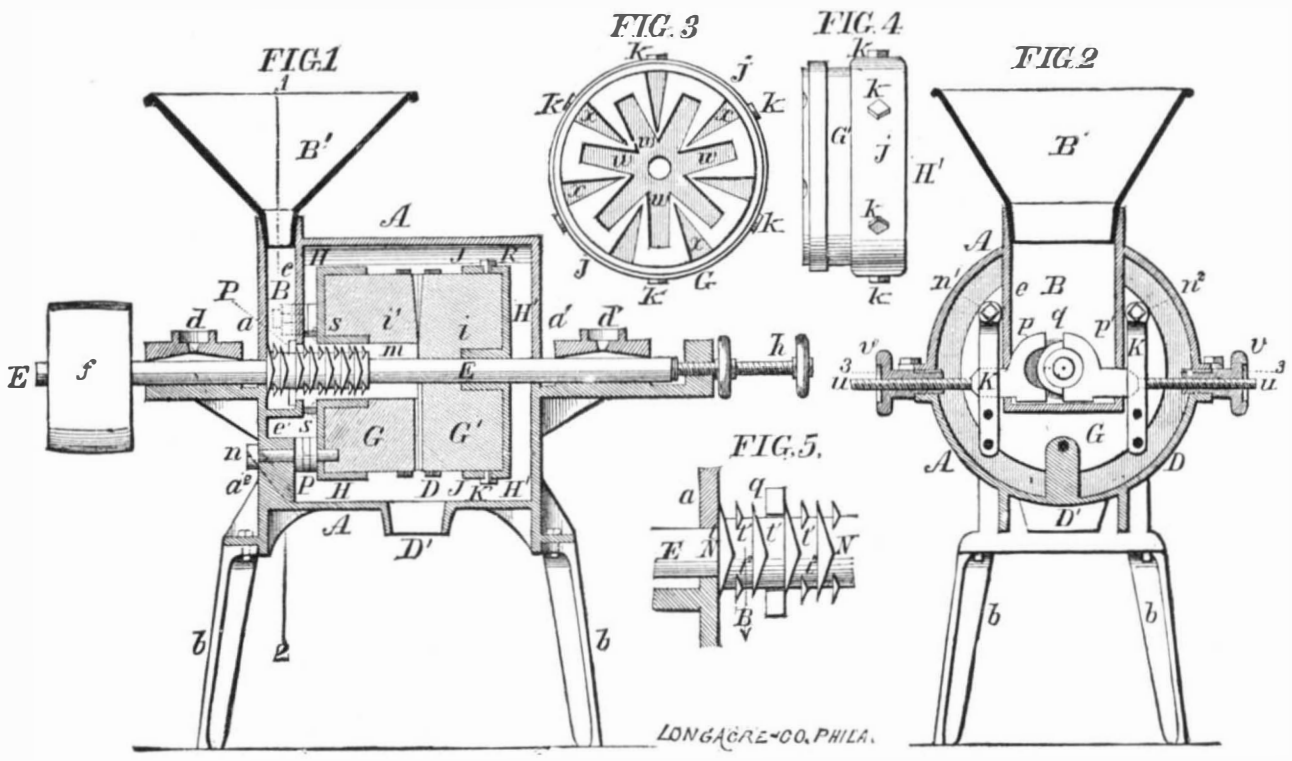
In the engraving Fig. 1 is a vertical section of the mill; Fig. 2 is a transverse vertical section; Fig. 3 is a face view of one of the millstones; Fig. 4 is an exterior side view of one of the stones, and Fig. 5 is an enlarged view of part of the mill spindle.

The cylindrical casing, A, is made in two parts, the interior being separated by a partition, *e e'*, into the feed compartment, B, communicating with the hopper, B', and the grinding compartment, D, devoted to the millstones, and having an outlet, D'. The horizontal mill spindle, E, has bearings, *d d'*, at opposite ends of the casing; one end of the spindle is furnished with a pulley, *f*, and an adjusting screw, *h*, bears against the opposite end. The screw is provided with a jam nut, which prevents it from becoming loosened accidentally. G and G' are the two millstones. The millstone, G', is secured to a flanged disk, H', the central hub, *i*, of which is fast on the spindle, E. As the millstone is vertical and revolves at a high rate of speed, it must be properly balanced in order to prevent the violent shaking of the mill. For this purpose there are in the flange, J, of the disk, H', a number of holes at equal distances apart throughout its circumference, each hole being threaded for the reception of the stem of a set screw, *k*. Should the stone be out of balance in the first instance, one or more of these set screws may be entirely removed at the proper points in the circumference of the disk, or lighter or heavier screws may be attached to the flange, until the stone is balanced.

The fixed millstone, G, is secured to a flanged disk, H, having a central opening forming a continuation of the eye of the stone. The disk, H, is secured to the end of the casing at three points—at one point to the enlarged portion, a^2, by a bolt, *n*, and at the other points by similar bolts, n^1 and n^2, to the upper ends of bars, K K, which are bolted at their lower ends to the inner face of the casing. Rubber cushions, *p*, are placed between the disk, H, and the casing, so that the stone, G, can be readily adjusted so that its grinding face will coincide with that of the stone, G'. Between the flanged disk, H, and the partition, *e*, there is a rubber ring, S, adapted to a recess in the outer face of the disk.

This ring prevents the grain from passing into the compartment, D. The only communication between the feeding compartment and the grinding compartment of the mill is through a circular opening in the partition exactly opposite the eye of the stone. A portion of the spindle (shown on an enlarged scale in Fig. 5) has a number of projections, N N, of triangular form, one edge of each projection being in a plane at right angles to the shaft, and the other two edges being inclined. This portion of the shaft, with its triangular projections, is contained partly within the feed compartment, B, partly within the opening in the partition, *e*, and partly in the eye of the stone. The feeding is effected by the triangular projections when the spindle is turned in either direction. This seems to be an important feature of this mill, as it enables the user to drive it in whichever direction may be most convenient.

The amount of grain fed to the eye of the stone will depend upon the position of the two adjustable gates, P P'. These gates are made to fit to the spindle between the triangular projections. When closed the gates will entirely cover the opening in the partition, *e*. One or both gates can be partially or wholly opened, as required. In the present instance the gates are adjusted by screws. In mills having stones the grinding faces of which are vertical, the flour is apt to pass from the stones having the ordinary dress in an unfinished condition. To avoid this the inventor has adopted the dress shown in Fig. 3, the depressed portions of the face of the stone being shaded and the land portion unshaded. The radial portion, W, concentrate at the center of the stone, and do not extend out through the edge. Hence they form pockets, from which the partially ground grain cannot escape without crossing the land before reaching the triangular depressions.



SECTIONAL VIEWS OF VERTICAL BURR MILLS.

Steamboat Inspection.

At a recent meeting in Washington, the Board of Supervising Inspectors of steam vessels amended rules 4, 14, 29, 40, 76, and 78 of General Rules and Regulations of 1877. It was also ordered that at their annual inspections of steam boilers the local inspectors shall remove from the surface of such boilers as are covered so much of the covering as may be necessary to enable them to examine parts of the boilers which cannot be properly examined from the inside. There is added to Rule 4, a method of testing boiler iron, which boiler makers will find important. Samples of iron may be tested on any reliable testing machine. Rule 14 provides that "All life rafts and floats composed of hollow cylinders, and approved by the Board of Supervising Inspectors, must be rated in their carrying capacity according to the cubical dimensions of such cylinders, in the ratio of one person to every three (3) cubic feet for ocean steamers, and two (2) cubic feet for lake, bay, sound, and river steamers. Such life rafts and floats must be suitably equipped with life lines and oars."

VERTICAL FRENCH BURR MILL.

The transportation of petroleum, especially on passenger vessels, is permitted only under stringent regulation. The use of steamers for excursions is also made subject to careful regulation, particularly with regard to ample provision of life saving apparatus.

RECENT AMERICAN PATENTS.

A simple and ingenious permutation padlock, which consists of a body, or case, a sliding hook having pins which are engaged by slotted disks, and a series of index disks connected with the slotted disks, is the invention of Mr. Mortimer B. Mills, of De Witt, Iowa.

An improved apparatus for casting metals in vacuo has been patented by Mr. H. W. Barnum, of Omaha, Neb. The mould is contained in a vacuum chamber, and the metal, in its passage to the mould in the chamber, is spread out upon a fan-shaped spout, allowing the injurious gases to escape from the metal before it reaches the mould.

Mr. Albert H. Hogins, of Morrisania, N. Y., has invented an improved ironing table, whose top has a movable wedge shaped section, which may be used as an ironing board for special purposes.

A simple and effective support for weak ankles has been patented by Mr. J. G. Pugsley, of Brooklyn, E. D., N. Y. It is intended to be worn with a shoe or boot, and is made of leather, felt, or cloth, the material being chosen to suit individual cases.

A shoe brush having a hollow back and tubular handle for containing liquid shoe blacking, and provided with a valve for letting out the blacking as the spreading brush is applied to the foot, is the invention of Mr. J. A. Stahle, of Crestline, O.

An improved beer faucet, which is constructed so that the operation of a single handle or lever will cause the escape of beer and the admission of air simultaneously, has been patented by R. W. Tavener, of West Bay City, Michigan. The faucet may also be used independently as a beer drawing or air forcing pump or as an air vent.

An improved telescope drinking cup having a stand which gives it the appearance of a goblet when in use, is the invention of Mr. G. H. Hazelton, of Birmingham, Conn. The stand, when not in use, is contained by the cup.

An improved pump having a heavy plunger fitted to a barrel, having at the top a large funnel for receiving water and at the bottom a single valve, has been patented by Mr. Rocco Misso, of Macon, Miss.

A wedge provided with a spring pawl, to be used in connection with one or more wedges having ratchet teeth, has been patented by Mr. L. F. Johnston, of Pocahontas, Ark. It is designed for splitting logs; the ratchet arrangement obviates bouncing or the slipping out of the wedge.

An improved ventilating flue cap, invented by Mr. John D. McLinden, of New York city has a rotary shield or cap which moves with great freedom and is not liable to become choked by the accumulation of soot around the spindle, the latter being incased by a tube.

Mr. M. J. Hughes, of Jersey City, N. J., has invented an improved apparatus for casting stereotypes, which simplifies and facilitates the operation of casting and preparing for the press. The invention consists in an arrangement of adjustable bars and slotted section pieces which cannot be clearly explained without an engraving.

Red and White Wine.

Physicians and others, in discussing the qualities of wine, and the effect of different kinds and vintages on the human system, have arrived at the conclusion that red wine is less injurious to the health then white wine. The subject has been revived latterly in the *Spectator*, and the following reason has been given for the difference in effect. Red wines are rich in tannin; white wines are not: the natural inference being that the astringent principle present forms a counteraction to the stimulating influence of the alcohol contained.

The Steam Engine versus the Horse.

A man may now obtain a mechanical motor, exerting the power of a horse for the price of a horse. If he be able to employ 100 horses, he can obtain 100 horse power in steam engines at a much lower price than he would pay for 100 horses. And the animals will only last a few years, eight or ten at the outside. They must be regularly fed, work or no work; they must rest for at least sixteen hours out of the twenty-four.

Take what pains we will, we cannot obtain a horse power from a horse at much less than 4*d*. an hour, taking into account the cost for twenty-four hours, and the work done in eight hours, or fewer. For the mechanical horse power, on the contrary, which becomes cheaper the larger the quantity in which it is employed, a cost of a penny per working hour is the outside for a small engine. For a large one a halfpenny or less per hour per horse power will cover all expense. And then the steam horse never tires. Instead of one rider being able to tire out three horses or more in a day, one steam horse will work steadily on so as to employ the successive care of three drivers in the twenty-four hours, if each work for only eight hours. And the steam horse eats only in exact proportion to the work he does. He costs, as matter of interest of money and depreciation, less than half the cost of the animal, per annum or per week. And as to provender, he consumes only the exact quantity which he converts into work. For all exertion of power in a continuous groove, then, the productive energy which is added to the resources of a nation by the discovery and application of the mechanical theory of heat is practically illimitable.—*The Builder*

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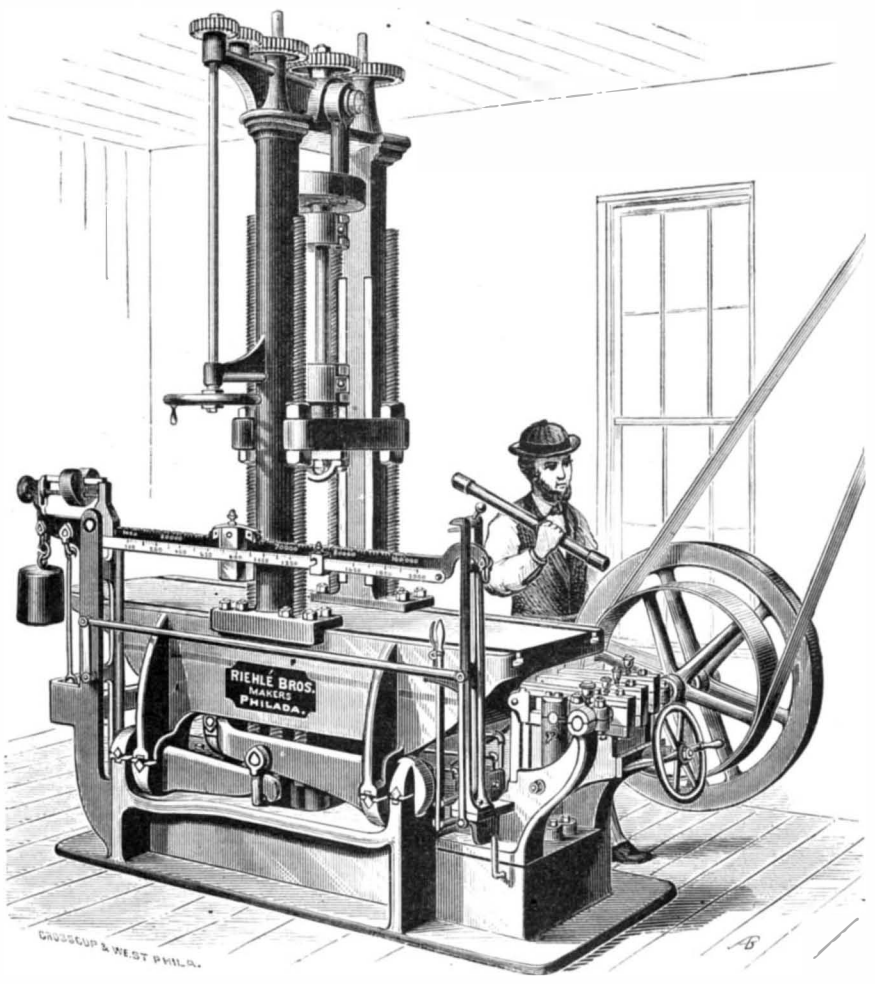
NEW TESTING MACHINE.

The testing machine shown in the accompanying illustration was built for the Pennsylvania Railroad Company. It is said to be one of the most complete and accurate machines yet produced at the Philadelphia Scale and Testing Machine Works, Riehlé Brothers proprietors. Although not of so great a capacity as a 300,000 lb. chain tester recently built at the same works, it contains a greater number of new and peculiar features, it being arranged for tensile crushing and transverse strain or pressure. The range of the machine is great; the crushing and tensile powers can accommodate specimens from four feet in length down to an inch or two, while the transverse power can be applied to bars from one to five feet in length. On the table, which is five feet in length, there are movable supports, that can be adjusted to any position to suit the specimen. A girder or beam of any length may be tested by bringing to bear against it a beam or girder of superior strength, the pressure on the center being indicated on the weigh beam. The machine is compact, powerful and well designed. The hydraulic cylinder in the center of the bottom frame, is encompassed by the leverage which supports the iron table or platform. The heavy base, which consists of a single casting, contains the steel bearings which support the levers, and in it is formed the reservoir which supplies the hydraulic pumps. The machine is thus self-contained, requiring no special foundation. The pump has three plungers, and consequently throws a steady stream. The stroke of these plungers or pistons can be lengthened or shortened, without stopping the motion, by turning the hand wheel seen at the rear end of the machine. This arrangement readily reduces or increases the flow of oil. When a long and ductile piece of iron is being tested the fast feed may be employed, and when about finishing the test, the stroke may be shortened. The manufacturers state that delicate tests of brittle substances can be made, as the minutest quantity of oil can be thrown into the hydraulic cylinder, and the supply of oil may be cut off or turned on instantaneously, while pumping still continues.

The upright hand lever, seen to the right, governs the rise and fall of the plunger, acting like the reversing lever of a locomotive. In case the operator should, through carelessness or neglect, allow the machine to act continuously, no injury can occur to the machine, as a safety valve opens automatically, and allows the oil to flow back into the reservoir. As it is sometimes desirable for the strain to remain upon the specimen for hours or days the manufacturers have provided a device which clamps the plunger, maintaining the strain at the required point. This is not a necessary portion of the machine, but it is a useful adjunct. The whole capacity of the machine, 50 tons, is marked upon the beam. The gripping tools are made for headed specimens, the well known clam shell pattern being used. Wedge grips are also provided for flat, round, or square specimens, the change from one to the other being readily made. The Pennsylvania Railroad Company, in their binding specifications, required extreme accuracy. It was required that in every case the registries of the loads on the scale beam must be within one two-thousandths of the actual load transmitted to the machine. This variation was allowed in consideration of the tremendous shocks to which the machine was subjected during the contract test from the breaking of the steel specimens, which was calculated to displace the parts; but it remained intact, and registered the pressure correctly.

These tests, together with others, were made at the works of Riehlé Brothers, and occupied the greater part of three days, at the end of which time the machine was approved. This apparatus was designed by T. Olsen, M. E., superintendent of Messrs. Riehlé Brothers' works, and patented February 11, 1879.

The dimensions of this machine are as follows: Height, 10 feet; width, 3 feet; length, 7 feet; weight, 6,800 lbs.



TESTING MACHINE. DESIGNED BY T. OLSEN.

Gloomy Thoughts and Gloomy Weather.

Dull, depressing, dingy days produce dispiriting reflections and gloomy thoughts, and small wonder when we remember that the mind is not only a motive, but a receptive, organ and that all the impressions it receives from without reach it through the media of senses which are directly dependent on the conditions of light and atmosphere for their action, and therefore immediately influenced by the surrounding conditions. It is a common sense inference that if the impressions from without reach the mind through imperfectly acting organs of sense, and those impressions are in themselves set in a minor æsthetic key of color, sound, and general qualities, the mind must be what is called "moody." It is not the habit of even sensible people to make sufficient allowance for this *rationale* of dullness and subjective weakness Some persons are more dependent on external circumstances and conditions for their energy—or the stimulus that converts potential into kinetic force—than others; but all feel the influence of the world without, and to this influence the sick and the weak are especially responsive. Hence the varying temperaments of minds changing with the weather, the outlook, and the wind.—*Lancet.*

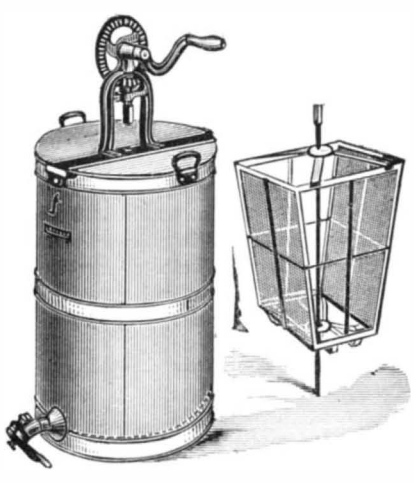
A NEW HONEY EXTRACTOR.

The advantages afforded by the judicious use of the honey extractor are acknowledged by every bee-keeper. The invention of the movable comb frames by Mr. L. L. Langstroth, and that of the honey extractor by Major V. Hruschka, are perhaps the greatest among all improvements pertaining to the apiary, having done more to systematize bee culture and multiply the product than all other inventions combined.

MUTH'S HONEY EXTRACTOR UNCAPPING KNIFE.

The accompanying engravings represent a new honey extractor recently patented by Mr. Charles F. Muth, of 976 and 978 Central avenue, Cincinnati, Ohio.

The construction of this machine will be readily understood by referring to the engravings. The comb basket, which consists of wire cloth fastened to a frame having slanting sides, is supported by a vertical shaft which is journaled in a substantial tin can. On the cover of the can are mounted a bevel wheel and pinion, by which a rapid rotary



motion is imparted to the comb basket. The separation of the honey from its comb is effected by centrifugal action. As the honey tends to separate from the comb by its own gravity the advantage of inclining the sides of the comb basket will be apparent.

The can is intended to hold 60 lbs. or more of honey below the comb basket, and the baskets can be made to suit the size of the comb frames in any particular case. The top of the can is tightly fitted to exclude dust and insects.

It is stated that this machine will extract the honey from the comb very rapidly and effectually. In the smaller figure is shown a thin-bladed knife for uncapping the honeycomb previous to placing it in the basket of the extractor.

Further information in regard to this useful invention may be obtained from the inventor, whose address is given above.

Treatment of Delirium Tremens.

Dr. G. W. Balfour, in a clinical lecture on the treatment of delirium tremens, printed in the *Lancet*, calls attention to an opinion very widespread, not only among the public but even among the profession, that delirium tremens does not arise from drinking, but from ceasing to drink. This idea he pronounces fallacious in the extreme. We are often told that so long as the patient is kept drinking, so long will he keep from an attack of delirium, while the very reverse is the case. So long as he keeps drinking he usually keeps from a bad attack, because a serious attack, as a rule, is associated with a loathing of drink; but he always keeps coming nearer to it, and the sooner his drinking bout can be arrested the less risk he runs of having an attack at all. So long as the patient is permitted to obtain drink, just so long will his case prove intractable to treatment; while when the treatment is continued, minus the drink, the cure is rapidly obtained. Dr. Balfour concludes that the administration of alcohol in any form during the course of delirium tremens is necessary only in very rare cases, where exhaustion is great, and even in these cases it delays the cure. Under the treatment recommended by him (which, for the benefit of professional readers, we may state is chloral), so rapid in its action, he believes it possible that alcohol may never be required in such cases, and that ordinary tonics may supply its place.

Recent Sunless Weather near London.

The past two months have been remarkably sunless, and although the records of registered sunshine at the Royal Observatory, Greenwich, only extend as far back as February, 1877, it will not be without interest to note a few facts from the records of sunshine since that date. Both in 1877 and 1878 June was the sunniest month, the number of hours of recorded sunshine being respectively 267·1 and 183·4. After June the monthly amount of sunshine declined steadily in each year to 27·0 and 16·3 hours respectively, in December, 1877 and 1878. In January, 1878, the hours of registered sunshine were 35·0, and in February, 32·9; whereas in the January of this year only 14·8 hours of sunshine were measured, the smallest monthly amount on record. During January last on only eight of the thirty-one days was any sunshine recorded; indeed during the fourteen days ending 5th February no sunshine was registered. With reference to the recent departure of frost it may be noted that the change of wind from northeast to southwest on Feb. 5th was accompanied by a marked increase in the amount of ozone in the air. The daily amount of ozone measured in the ten days ending 4th February was but 0·7, whereas in the four days of southwest wind ending on Saturday last the degrees of ozone averaged 9·9.—*Lancet.*

RECENT AMERICAN INVENTIONS.

A novel tool for the use of glaziers and manufacturers of picture frames, has been patented by Mr. Wm. H. G. Savage, of Kingston, Ontaria, Canada. It consists of a receptacle having a spring acted follower, and containing the points or brads used in fastening the glass. A metallic plate is connected with the handle of the instrument, and contrived so as to carry a single brad or point out of the receptacle and drive it into the sash or frame as the handle is moved forward.

An improved coffee roaster, invented by Rachel Davis, of Omaha, Neb., is constructed so that the body of the cylinder in which the coffee is placed, as well as the handle for moving it, are kept from actual contact with the stove during roasting, thus avoiding the burning of the coffee.

Mr. A. L. High, of Mount Holly, N. J., has invented a picture exhibitor, consisting of several picture carrying wheels journaled on a common axis in a suitable picture frame, and arranged so that they may be turned by a key inserted in the face of the frame, to bring the pictures successively into view.

An improved bill file, in which the papers can be arranged in chronological order without being folded, has been patented by Mr. E. H. Owen, of Los Angeles, Cal. It is designed to facilitate the inspection of the papers and to avoid folding.

Messrs. John Searl and E. G. Bly, of Haverhill, Mass., have invented a shoe, whose vamp, quarters, and flap are made in one piece from a blank of peculiar form. The button hole piece is made separately and sewed on.

An improved animal trap has been patented by Mr. S. J. Bennett, of Harrison Township, Daviess County, Mo. This is an improvement in tilting platform traps for catching rats, mice, mink, and other animals. It combines several novel features, which cannot be described without an engraving.

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SOME ANATOMICAL PECULIARITIES IN THE MALE CHIMPANZEE.

The body of the male chimpanzee, which recently died at the Philadelphia Zoölogical Gardens, was immediately removed to the Medical Department of the University of Pennsylvania, where Dr. Joseph Leidy, Professor of Anatomy, has been gradually dissecting it. Dr. Leidy has already dissected the bowels, lungs, and brain of the animal, which has enabled him to develop certain facts in the anatomy of the chimpanzee not hitherto known. There were in some respects several marked differences between the brain of the female champanzee, which was dissected in Philadelphia some weeks since by Dr. H. C. Chapman, and that of the male now dissecting by Dr. Leidy.

Dr. Chapman reported, in his paper on the subject read at a late meeting of the Philadelphia Academy of the Natural Sciences, that the brain of the animal under his examination closely resembled that of a human being, with the exception of the fact that the cerebrum did not cover the cerebellum. This statement coincides with that of a distinguished anatomist whose dissection of the body of a champanzee, many years ago, is one of the few cases on record. Dr. Leidy, on the other hand, found that, in the case of the male champanzee, the cerebellum is covered by the cerebrum, so rendering the resemblance anatomically exact between its brain and that of man, and at the same time showing that the intellect of the male champanzee is greater than that of the female. From this fact the inference may readily be drawn that the present is the only case on record in which an anatomical examination of a male chimpanzee has been made.

Another striking difference in the anatomy of the male and female chimpanzee is a most remarkable peculiarity in the formation of the vocal organs. This peculiarity consists in the possession on the part of the male chimpanzee of a natural bagpipe, which communicates with the larynx and extends into the chest and armpit. This bag is covered by powerful muscles. To produce a loud sound by means of this bag but a slight motion of the arms is necessary. When Dr. Leidy discovered this bagpipe he at once wrote to the superintendent of the Zoölogical Gardens to inquire if the male chimpanzee had any distinctive call or cry. In reply he received answer that the "voice of the male, for so young an animal, was simply enormous; and that its cry, when enraged, was loud, piercing, and shrill." It is a well known fact that this physical arrangement is found in the male gorilla, in the orang-outang, and in the howling monkeys of Southern Africa, whose cry can be heard for miles.

The body of the animal will be preserved and placed in the Medical Museum of the University. Dr. Leidy will shortly incorporate the result of his examinations in a paper to be presented to the Philadelphia Academy of Natural Sciences.

Professor Tyndall on the Electric Light.

At a recent meeting of the Royal Institution, Professor Tyndall delivered a discourse on "The Electric Light." He commenced by expressing his thanks to all who had afforded him information about the various arrangements for electric lighting now before the public, and those which have for a while held their ground, but have been superseded. The electric light has been known for 70 years, as in 1808, and again in an improved form in 1810, it was shown to audiences at the Royal Institution. Sir H. Davy's carbon points "threw sunshine into the shade," and in 1808, 2,000 pairs of plates, obtained for the Institution by subscription among the members, produced such heat from the current they gave that quartz and calcium were melted as wax. It was early known that to produce heat and light in a circuit there must be resistance. This was illustrated by a wire composed alternately of platinum, which resists, and of non-resisting silver, when on the passage of a current the platinum became dazzlingly white hot. A non-resisting copper wire will carry enough electricity to split a resisting oak tree. In the case of two carbon points, this resistance causes the one point to waste with double the rapidity of the other. This, which was formerly regarded as one of the two great obstacles to the general introduction of the electric light, had been overcome by various appliances of clockwork, which kept the two points at the proper distance apart. The second great obstacle was a more serious one, depending on the inexorable law of nature which demands an expenditure of force of one kind for the production of another. Zinc may be burnt in air, that is, oxidized; it may be also "burnt" or oxidized in acidulated water, but it has to displace the oxygen from the hydrogen for this to occur, and four fifths of the heat produced are used up in this process. So that when zinc is thus "burnt" only the remaining one fifth is available. The rate of "burning" makes no difference; one ounce of zinc, for example, always gives out the same amount of heat.

This "burning" of zinc which had been used in the production of electricity was an expensive fuel, and this seemed to be a very great drawback to the general use of the electric light. In the year 1831 a discovery was made at the Royal Institution by Faraday—that of magneto-electricity. He showed that when the earth's lines of magnetic force are cut, an electric current is produced. Prof. Tyndall quoted Faraday's saying, that he would rather occupy himself with finding fresh effects than spend his time in exalting those effects. But it was the exaltation of those effects which he first studied in a simple way which has led to the present possibilities of our electric lighting. In 1854, Werner Siemens, of Berlin, invented what is now known as a Siemens armature, with 16 permanent magnets, in the working of which there is only the ordinary mechanical friction to be overcome. Working the machine by hand, the expenditure of muscular force becomes apparent as heat through the machine. But this and the Wilde and Gramme machines in the same way show that the external work falls short of the originating work.

Now, whatever electricity is, it is a swift carrier of heat. We have motive power converted into current, and then we can have current converted into motive power. For example, Sir William Armstrong has his electric light worked by a water wheel. The great advance on Faraday's spark of 1831 as to practical use is the use of a cheap fuel—coal—for obtaining through the steam engine the motive force required. All the various modifications of the light as now used depend on this.

Prof. Tyndall gave a historical sketch of the various arrangements, beginning with that of Mr. Holmes, in 1862. He did not believe any fresh scientific discovery was needed to make the electric light of general application to large places. The scientific man knew what different natures of machines were required to do the different kinds of work to be done. It remained now for mechanical skill to carry out the work.

Preservation of Iron.

Capt. Bourdon has devised simple forms of apparatus for coating iron with Barff's magnetic lacquer. In the course of his experiments he found that the coat of oxide could be formed by the air in the following manner: The serpentine part of a sheet iron reservoir communicates with air which is heated to 248° Fah. The current of hot air, after circulating through the serpentine, reaches the cylinder which contains the articles to be lacquered. The escape spout communicates with a water aspirator regulating the flow of air, which should be very gentle. The internal pressure is little more than one atmosphere, the apparatus being in communication with the open air. The temperature of the air in the cylinders is 536° Fah.; the operation lasts five hours, giving a coat 0·05 of a millimeter thick (0·002 inch), of a beautiful greenish black, resisting the action of fine emery paper and of dilute sulphuric acid. After the articles are taken from the cylinder, they are rubbed with a greasy rag, and spots are removed by fine emery paper or scouring grass. Spots may generally be avoided by suspending the pieces, so that they will not touch each other or the walls. If the temperature is raised to about 572° Fah., a thick coat is secured, but it is apt to scale. Articles thus lacquered have been exposed to snow and rain for a month without getting any spots of rust. If the black coating is removed by emery paper, there is a grayish layer on which rust does not take much hold; the spots can easily be removed by a bit of hard wood. Barff has observed the same peculiarity in articles which have been steam lacquered.—*Ann. des P. et Chauss.*

The Study of Hair in its Medico-Legal Aspect.

In a recent monograph on human hair by M. Jeannot, the author proceeds first to point out the difference which exists between hair in a healthy or diseased state of the body, and on the corpse; and then gives certain peculiarities by which we may be enabled to distinguish between human and animal hair; and, finally, shows what varieties are found in hair itself, in reference to its place of growth, and the age and sex of the individual. He then goes on to prove how very important a knowledge of all these facts may be in any case of supposed murder; for in this way hair found either on the instrument with which the crime has been committed, or on the clothes of the victim, may help to identify the murderer. The author afterward shows by what means it is possible to prove whether hair has been pulled out by violence, cut off, or whether it fell out spontaneously. One very interesting point advanced is the assertion maintained by Hoppe-Seyler and Sonnerschein, that arsenic may exist and be traced in the hair of persons who have died from the effects of this poison. The truth of this theory, however, remains to be proved; all the experiments made by Stadel on patients under treatment with arsenic have always given negative results.

Yellow Fever in Winter.

In spite of midwinter cold cases of yellow fever are reported at New Orleans and Vicksburg. In some cases returned refugees entering houses that have been closed since summer are said to have taken the disease; in other instances the disease is attributed to the active disinterment of victims hastily buried when the plague was at its height. In Mississippi and Tennessee physicians insist that if this dangerous work is not stopped a return of the epidemic may be expected in the spring; and in some cases the health commissioners have been compelled to forbid the removal of last summer's victims. Wealthy families, no doubt, find it painful to leave their dead in potters' fields, but personal feeling should not be suffered to endanger the entire community.

BLACK LACQUER FOR METAL AND WOOD.—Nine parts of shellac are dissolved in fifty parts of methylic alcohol and set aside for a few days. Then ten parts of pulverized asphaltum are dissolved in fifty parts of coal tar benzine. Both liquids being mixed, a sufficient quantity of lampblack is added to give it the required density. When necessary, it may be diluted with a mixture of alcohol and benzine.—*Chemiker Zeitung.*

Self-Illuminating Watch Faces and Clock Dials.

M. Olivier Mathey, a Neufchâtel chemist, and the manufacturer of the well-known "diamantine," communicates the following information in regard to the composition of these dials, to one of our foreign exchanges:

Phosphorescent dials are usually made of paper, or thin card-board, enameled like visiting cards. They are covered with the adhesive varnish, or with white wax, mixed with a little turpentine, upon which is dusted, with a fine sieve, powdered sulphide of barium—a salt which retains its phosphorescence for some little time. The sulphides of strontium and calcium possess the same property, but lose it more quickly than the former. After the dial has remained in darkness some days it loses its phosphorescence; but this may be readily restored by exposure for an hour to sunlight; or, better still, by burning near the dial of a few inches of magnesium wire, which gives forth numerous chemical rays.

M. Recordon, of Paris, states that two years ago he took out a patent for, and has since been manufacturing, illuminated dials on an entirely different principle from those produced by the use of chemicals. His device is this: A Geissler tube, containing a gas which gives a brilliant light, is placed on the dial; a battery about the size of a thimble is attached as an ornament to the watch chain, and a miniature induction coil is also hidden in the latter. When it becomes desirable to consult the watch in the dark, a spring is pressed, the current passes into the coil, then into the Geissler tube, and illuminates the dial. The portable battery used for this purpose is that of Trouvé, which, in a small compass, has considerable strength. Reduced to the size of a thimble, it is still sufficiently strong in its action to last a year. Mons. Recordon also applies the same principle to the illumination of clock faces.—*The Watchmaker.*

The Fermentative Power of the Papaw.

The question of the fermentative action of the juice of the papaw (*Carica papaya*) upon animal tissues has received some confirmation from the experiments of Herr Wittmack, which he recently embodied in a paper communicated to the Natural History Society of Berlin. The juice, as obtained from the fruit, is of a white milky character, and is present in the fruit apparently only in small quantities, for Dr. Wittmack obtained, after repeated incisions made in a half-ripe fruit, only 1·195 grain of the milky juice of the thickness of cream. When dried it has a strong odor and flavor of petroleum or vulcanized India rubber. In the experiments some juice was dissolved in three times its weight of water, and some fresh lean beef boiled in it for five minutes. Below the boiling point the meat fell into pieces, and at the close of the experiment it had separated into coarse shreds. Fifty grains of beef in one piece, enveloped in a leaf of the papaw and left in this position for a period of twenty-four hours, at a temperature of 15° C., became perfectly tender after a slight boiling, while on the other hand a piece of meat of similar size and weight, simply wrapped in paper and heated in the same manner, remained quite hard. The experiments prove that in the milk juice of the papaw a ferment resides which has a powerfully energetic action upon nitrogenous substances, and it is to this action that the peculiar and well known property of the papaw is attributable.

New Mode of Manufacturing White Lead.

The molten lead is poured through an iron sieve into a tank filled with water. Hereby it is converted into threads of one sixth of an inch in thickness, which are now placed in vats, each of which holds about 1,000 threads. Vinegar is now poured over the lead, and immediately drawn off again. Under the influence of the air and the vinegar adhering to the metal, the latter is oxidized. The vinegar is now poured into the vat and again drawn off, when it carries away the acetate formed on the surface of the metal in solution. After this process has been repeated a number of times, the vinegar has been transformed into a concentrated solution of basic acetate of lead, from which the carbonate may be prepared by the introduction of a current of heated carbonic acid gas. The supernatant liquid is, mixed with another quantity of vinegar, used again for the same process.—*Chemiker Zeitung.*

Hop Fiber.

A German agricultural journal reports that Mr. Nordlinger, of Stuttgart, has invented and patented a process by which hop stems can be made the source of fiber almost equal to flax. The stems and other parts of the plant are boiled in water, to which soap or soda has been added, for three quarters of an hour, thoroughly washed, and then again boiled in very dilute acetic acid. The fibers are now washed free and dried, and when properly combed can be worked like other textile materials. They are said to resemble flax fibers very closely, and to be superior to all others in elasticity, softness, and durability. It is much to be hoped that this process of employing the stems may prove a practical success, for at present, if the hop itself fail, the crop so tenderly nurtured is little less than a dead loss to the unfortunate grower.

PYROPHOROUS IRON.—Iron sponge, which ignites on contact with the air, may be obtained by heating tartrate or oxalate of iron in a narrow-necked vial to complete decomposition, and closing the vial immediately. The residue, which is magnetic and of a velvet-black color, ignites and burns with a beautiful red flame when exposed to the air.—*Chem. Notizbl.*

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The Shipping of New York.

The collection district of New York includes the waters of New York Bay and Harbor, East River and Long Island Sound bordering on Westchester county, to the Connecticut line, the north and south shores of Long Island, Staten Island, and that part of Hudson and Bergen counties lying on New York Bay and Hudson River, and the navigable waters of the Hudson River. The district possesses a water front of about 700 miles, and the wharf fronts of New York port cover 25 miles. Marine sailing papers are issued at New York city, Albany and Troy, on the Hudson, and Cold Spring, Port Jefferson and Patchogue, on Long Island.

The registered shipping of the port of New York on the first day of January, 1879, was as follows:

Sail vessels under register foreign trade, number 814; tonnage 481,545·28.

Sail vessels under enrollment or license for the coasting trade or fisheries, 1,384; tonnage, 100,922·81.

Steamers under register foreign trade (wood hulls), 43; tonnage, 56,146·43.

Steamers under register foreign trade (iron hulls), 19; tonnage, 43,266·25.

Enrollment or license coasting trade (wood hulls), 546; tonnage, 138,241·49.

Enrollment or license coasting trade (iron hulls), 34; tonnage, 35,812·93.

Total of steam vessels, 642, with 273,467·10 tons.

Barges and rigged vessels enrolled or licensed, 379; tonnage, 94,234·24 tons, to which may be added the total sailing vessels as above, namely, 2,198, of 582,468·09 tonnage, and 642 steam vessels, of 273,467·10, making the grand total number of vessels of the port of New York 3,219, with a capacity of 950,169·93 tons.

The shipping of the other ports of the district (mostly sail vessels and barges) was, on the same day:

Albany, 304 vessels, 46,306·39 tons; Troy, 465 vessels, 45,656·06 tons; Patchogue, 193 vessels, 2,811·77 tons; Port Jefferson, 119 vessels, 10,723·23 tons. Making a total, for the entire district, of 4,398 vessels, with a capacity of 1,052,-731·42 tons.

The steam fleet of the district numbers 811 vessels, embracing a tonnage of 302,820·42. It is estimated that if all the above vessels were placed in a line they would reach from Albany to New York, a distance of 144 miles.

Anatomy of Walking.

Dr. J. W. Ranney gave a lecture the other evening at Chickering Hall on anatomy and physiology, with special reference to athletic exercises. After giving a description of the human skeleton, of the skin and its various glands and vessels, the doctor addressed himself to the muscular system, which was illustrated, first with histological micrographs, and finally with a general plan of the muscular arrangement projected upon a screen. The most novel part of the lecture was the exhibition upon the screen of tabular statements of the amount of force required to carry on the various physical operations. Premising that a foot ton is merely a symbol for the power required to raise one ton a foot high, the relative amounts of power expended in vital action, concerned in vital movements, and required for the production of animal heat for one day are, respectively, 260, 300, and 2,840 foot tons. To row one mile at racing speed requires an expense of 18·56 foot tons of muscular energy; to walk one mile, 17·75 foot tons; to walk one mile, carrying a knapsack weighing 60 pounds, 24·48 foot tons. The force expended in a day's work is calculated at from 250 to 350 foot tons.

Dr. Ranney took occasion in the course of his lecture to inveigh very severely against the mania for walking which is now prevalent, in which young women, without training and without proper preparation, attempt such impossible tasks as walking 3,000 quarter miles in 3,000 consecutive quarters of an hour. Such practices, he said, were not athletic exercises in any proper sense of the term, but downright cruelty, and he hoped the time was not far off when spectacles of this class would cease. Dr. Ranney regards rowing, when properly pursued, as a finer and more healthful exercise than walking.

The St. Gothard Railway Tunnels.

'In addition to the great tunnel, thirteen miles long, there are on the St. Gothard Railway twelve other tunnels, the shortest of which, Waren, is 1,106 yards long, while the longest, the Olberg, reaches 2,027 yards. The total length of these twelve tunnels is very nearly ten miles—15,578 meters. Then there are five tunnels between 220 and 550, and twenty-five between 110 and 220 yards, making in all fifty-two subsidiary tunnels, of an aggregate length of 16 miles. Between Immensee and Goschenen there will be thirty-three tunnels; between Airolo and Giubiasco, seventeen. The highest part of the line above sea level is the big tunnel, 3,307 feet; the lowest a point between Cadenazzo and Magadino, 675 feet. The line will be carried over sixty-four bridges and viaducts, the longest of which, that of Cadenazzo, in Tessin, will consist of five arches, each having a span of 55 yards. The total length of the Gothard line will be 151 miles, 17 per cent of it being tunnels and 1 per cent bridges and viaducts. In the first instance the line for the greater part of its length will be single, but the tunnels and permanent way are to be so arranged that additional rails can be laid down so soon as the financial success of the enterprise seems to be assured. If all goes well, the entire length of road will be in running order in from four to five years.

THE PRAXINOSCOPE.

We are all familiar with the zoetrope, which consists of a short cylinder, on the walls of which are represented different positions taken successively by a body in motion. These representations are viewed through longitudinal slits in the cylinder while it revolves at great speed. The pictures viewed in this way appear as if possessed of life. This is certainly one of the most curious of optical phenomena. The accompanying engravings represent an apparatus based on an entirely different principle.

In the praxinoscope, as the apparatus is called by the inventor, Mr. Reynaud, the different pictures representing the consecutive positions of a moving body substitute each other incessantly, the light remains constant in brightness, and it is stated that it constantly presents to the eye an image of a moving body, without exhibiting the slightest irregularity or interruption.

A mirror, A B (Fig. 1), being placed at a certain distance from a picture, C D, the image of the latter will be reflected and visible at C′ D′. When we now turn the mirror as well as the picture, C D, around a common center, O, in the same direction, so that they will occupy positions at B E and D F respectively, the image of the picture will be seen at C″ D″. As will be seen, its axis has remained unchanged.

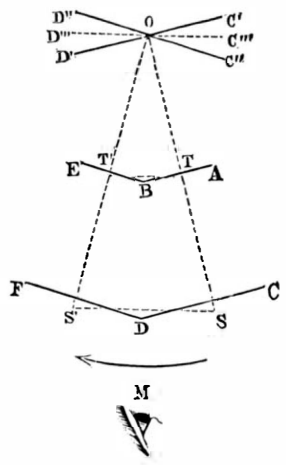

Fig. 1.—THE PRAXINOSCOPE.

If another mirror is placed at A B and another picture at C D, the eye being placed at O, one half of the first picture will be reflected from O D″, and one half of the second picture from O C′. When both pictures and mirrors are turned, the second mirror at T T′ and the second image will be fully visible at C‴ D‴. Afterward the second mirror and the picture will be found in B E and D F respectively. By replacing them by another mirror and design at A B and C D, the same succession of changes of position will be produced.

In the apparatus of Mr. Reynaud the pictures are placed within a polygonal box. Turning around a common center there is a concentric polygonal prism formed of mirror plates, and having a diameter equal to the radius of the exterior

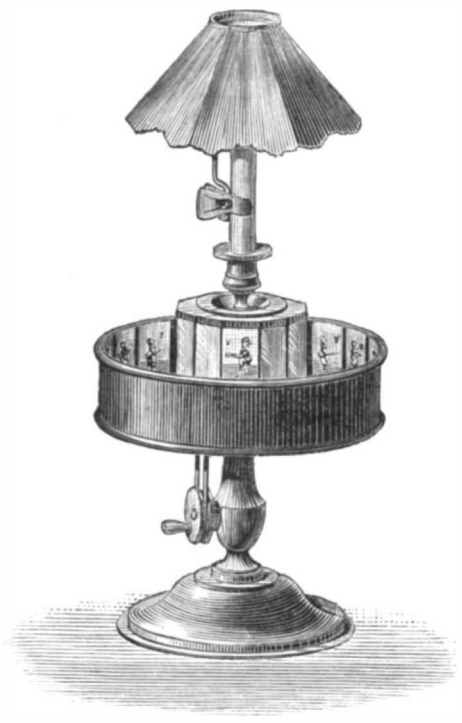

Fig. 2.—THE PRAXINOSCOPE.

polygon, as shown in Fig. 2. The box carrying the pictures and the reflecting prism is revolved at a moderate speed by means of a crank, pulley, and cord.

In the evening the apparatus may be lighted by a lamp or gas flame, the light being reflected downward by a shade.—*G. Fussandier, in La Nature.*

The Piezometer.

This is an apparatus invented by Dr. W. E. Woodbridge, M.D., in 1853. It signifies a pressure measurer, or, more accurately, a measurer of a great or hard pressure. Among all the philosophical instruments that have been invented this deserves to take a place as one of the most ingenious. It consisted essentially of a small steel cylinder, in which was placed a piston fitting it accurately. The cylinder was filled with oil, on which the piston rested, and was screwed into the bore of the gun, inside the powder chamber. All liquids are compressible in a very small degree. When the powder in the gun was fired, the piston was forced down on the oil in the piezometer and compressed it. The distance to which the piston was driven in was recorded on what may be termed the piston rod by a small steel point in the side of the cylinder, which scored a line in the side of the rod. The length of this line was subsequently measured by a micrometric scale, divided into ten-thousandths of an inch, with the aid of a microscope. In order to establish a standard of comparison, the compression of the oil under various pressures was first ascertained by means of a hydraulic press and gauges of special construction. Precautions were taken to prevent changes in temperature from affecting the accuracy of the indications of the instrument.

The experiments were made at Washington Arsenal in 1855, under the direction of Major Alfred Mordecai. Two six pounder guns, one of iron, the other of bronze, were used. The diameter of the bore of each at the shot was 3·69 inches, very nearly. The iron gun was used in the first three experiments, the piezometer being attached to the bottom of the bore. It was afterward pierced through the side to receive the instrument, inclosed in a hollow steel plug, the place in the hole being 1·5 inch in advance of the bottom of the bore. It was thus employed in many experiments. The bronze gun was, however, more used. It was drilled with nine holes at different distances from the bottom, beginning with 1 inch and ending at 47·8 inches. They were arranged alternately to the right and left of a central vertical plane in the upper half of the gun, and inclined 45° to that plane. Not the least interesting feature in the trials consisted of tests made with a musket barrel. The results obtained are very instructive, and support most of the theories held in the present day concerning the action of fired gunpowder. For example, the larger the charge the greater the pressure, irrespective of the space in which the powder was fired. Thus, while pressures of as much as 22,000 pounds, or over 9·8 tons to the inch, were registered in the six pounders, the highest that would be got in the musket barrel was 18,500 pounds to the square inch.

Bennet Woodcroft, F.R.S.

The death is announced of Mr. Bennet Woodcroft, for many years the executive officer of the British Patent Office. Mr. Woodcroft was widely known as a successful inventor, manufacturer, and author of several works relating to invention and the industrial sciences, as well as an efficient public officer. Born in December, 1803, Mr Woodcroft early learned the art of weaving. He studied chemistry under Dalton. On reaching his majority he joined his father in business as dyer and velvet finisher, at Manchester. In 1826, in one of his patents, he described himself as a silk manufacturer. About this time he became acquainted with Whitworth, Nasmyth, Fairbairn, and other eminent Manchester mechanicians. In 1843 he started in Manchester as consulting engineer, removing to London in 1846. From 1847 to 1851 he occupied the Professorship of machinery at University College, and in 1852 was appointed Superintendent of Specifications in the British Patent Office, becoming, in 1864, the sole controller of the department, with the title of Clerk of the Commissioners. From this office, which he had filled with signal ability for twelve years, he retired in March, 1876. His death occurred at his residence in South Kensington, February 7.

Mr. Woodcroft took out his first patent when only twenty-four years of age. It was for processes and apparatus for printing yarns before being woven. It was a valuable invention, and notably useful in the manufacture of ginghams. His next inventions were in naval engineering, the principal being the well known increasing-pitch screw propeller. About the same time he patented certain improvements in calico printing. The patent with which his name is most widely associated was granted in 1838, for an improved tappet for looms. In his official capacity Mr. Woodcroft is accredited with the foundation of the South Kensington Patent Office Museum, the Patent Office Library, and many improvements in the management of the Patent Office.

A New Insect Pest.

At the annual meeting of the New York State Agricultural Society, held in January last, at Albany, Mr. J. A. Lintner, the entomologist of the State Museum, read a paper in which, among other injurious insects recently observed, he gave an account of the larvæ of an insect which had been discovered two years ago in several localities in eastern and northern New York, hidden within the seed pods of the red clover, and destroying the seeds. The perfect insect had not yet been seen, but the examination of the larva showed it to belong to the cecidomyidæ, and in all probability very nearly allied to the wheat midge. A description of the larva was given under the name of *Cecidomyia trifolii*, Lintn. (n. sp.).

The range of the insect's depredations, or the extent of its ravages, was as yet unknown. In some localities in the western counties of New York the clover was so infested with it last year that it was worthless for seed. It is believed that the not infrequent failure heretofore reported of the clover seed crop throughout the country, which has been ascribed to imperfect fertilization of the blossoms and various other causes, has been the result of the secret operations of this destructive little insect.

It is said that a gentleman of wealth and liberality, in the city of Rochester, whose name is not given for the present, proposes to furnish a site and build an observatory for Professor Lewis Swift, at an expense for both of $20,000, provided a glass of sixteen inches in aperture is purchased. Such a telescope complete, with globe and charts, will cost several thousand dollars. The heirs of the late Lewis Brooks have already given $3,000 toward a telescope, and an effort is to be made to raise the necessary sum remaining by subscription.

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SOME RECENT INVENTIONS.

The accompanying engraving shows several inventions for which patents were recently issued from the United States Patent Office.

Figs. 1 and 2 represent a bolt holder, invented by Mr. Martin Ketchum, of Avon, N. Y. Its design, as the engraving indicates, is to prevent a bolt from turning while the nut is turned. It consists in a frame containing a sliding bar, having formed on one of its sides a rack which is engaged by a sector lever. The sliding bar is shown in detail in Fig. 2.

A brush for cleaning boiler flues, invented by Mr. C. C. Miller, of Hamilton, Ohio, is shown in perspective in Fig. 3. A spiral wire, shown in detail in Fig. 4, is placed between two disks for receiving the wire, whalebone, cane, or other material used in filling the brush. When the brush requires refilling it may readily be done by loosening the bolts that bind the two disks together, pulling out the old filling, inserting the new, and tightening the bolts. The device seen suspended from the brush handle is designed to guide the brush centrally through the flue; it also permits of thrusting the brush entirely through the flue and drawing it back again without catching.

Figures 5 and 6 represent an improved horseshoer's rasp, patented by Mr. C. H. Perkins, of Providence, R. I. This rasp enables the blacksmith to make the hoof even and level on both sides at a single operation.

Fig. 7 shows a novel form of combined candlestick and match safe, patented by Mr. G. E. Heinig, of Louisville, Ky. Its construction will be readily understood from the engraving.

A self-lighting lamp, recently patented by Mr. H. W. Covert, of New York city, is represented in Fig. 8. In this invention a lamp having a small continuously burning wick is employed. A spring-acted mechanism, which is released by the clock at a given time, is employed to turn up the larger wick, which is lit by the smaller one.

In Fig. 9 is represented a liquid tank, having a measure attached under the bottom, and a two-way cock for letting the liquid from the tank into the measure and for letting it out of the measure. A small pipe extends from the measure to the top of the can to allow air to enter and escape. This measure is the invention of Mr. J. J. Roberts, of Geddes, N. Y.

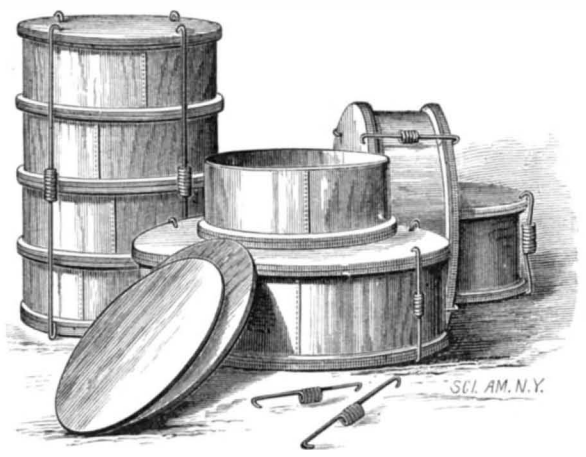
A novel medicine spoon, patented by Mr. E. K. Walker, of Exeter, N. H., is shown in Fig. 10. The handle has a longitudinal groove on its upper side, and is notched and numbered. A small rubber ring is placed around the handle in the notches corresponding to the number of drops to be given. The spoon has a peculiar lip which facilitates dropping.

In Fig. 11 is represented a combined fan and caster, the invention of Mr. Joseph S. Letord, of Nevada, Mo. The fans are drawn down by the foot, a cord extending from each arm to a single cord running downward through the table and attached to a pedal for this purpose. The fans are raised by elastic cords connected with a spindle at the top of the caster.

A NEW PACKING BOX.

In these days of competition, manufacturers and dealers vie with each other in details of trade which were unthought of a few years ago. This is nowhere more noticeable than in the packages or cases used for containing goods. For many purposes some novelty in the form of the package seems to be the great desideratum, while in other cases the form is of little account compared with other considerations.

In the accompanying engraving is shown a box recently patented by Mr. G. W. Bradley, of Sunderland, Vt., which seems admirably adapted to certain purposes, while it seems to fulfill the requirements for general uses.



BRADLEY'S PACKING BOX.

The construction of this box will be readily understood by reference to the accompanying engraving. It consists of a hoop of tough wood fastened together by stitching. The heads, which are both loose, are held in place by the fasteners, which are simply wires having a spiral spring formed at the middle and hooks at each end. These wires are hooked over the heads, forming a simple, cheap, and secure fastening. In some cases the inventor uses a thin veneer lining inside of each head.

Although these boxes are made in various sizes, the one pound box seems to be best adapted to general use. If it is required to place more than a single pound in a package, it may be done by fastening several of the boxes together with long fastenings. The inventor has a novel method of packing a number of the boxes in a single case, which insures safe transportation and prevents the spoiling of the contents of the boxes. After arranging the boxes in the case, the interspaces are filled as far as possible with square blocks of wood and the remaining space is filled with fine salt. The inventor states that this method has proved more satisfactory than the use of refrigerants. In addition to the improved method of packing, Mr. Bradley has devised improved machinery for manufacturing the boxes rapidly and cheaply; he has also invented a machine for filling the boxes by foot power.

ENGINEERING INVENTIONS.

An improved packing for stuffing boxes, consisting of a metallic box divided longitudinally into two sections and having flaring ends, into which are fitted beveled packing rings having diagonal laps or joints, has been patented by Mr. G. C. Phillips, of Gold Hill, Nevada.

A car coupling, recently patented by Mr. R. B. Potter, of Kansas City, Mo., has a gravity arm that swings in the draw head and carries the coupling pin, which it drops into the link when the latter, in entering the draw head, strikes the lower end of the swinging arm.

Another car coupling, patented by Mr. John Worrall, of Viola, Iowa, is to be used in connection with the ordinary coupling link and pin, and is designed to be operated from the top of the car.

Mr. George R. Hamilton, of Waynesville, Ohio, has invented a simple and easily operated car coupling, which acts automatically, and will uncouple itself in case of accident.

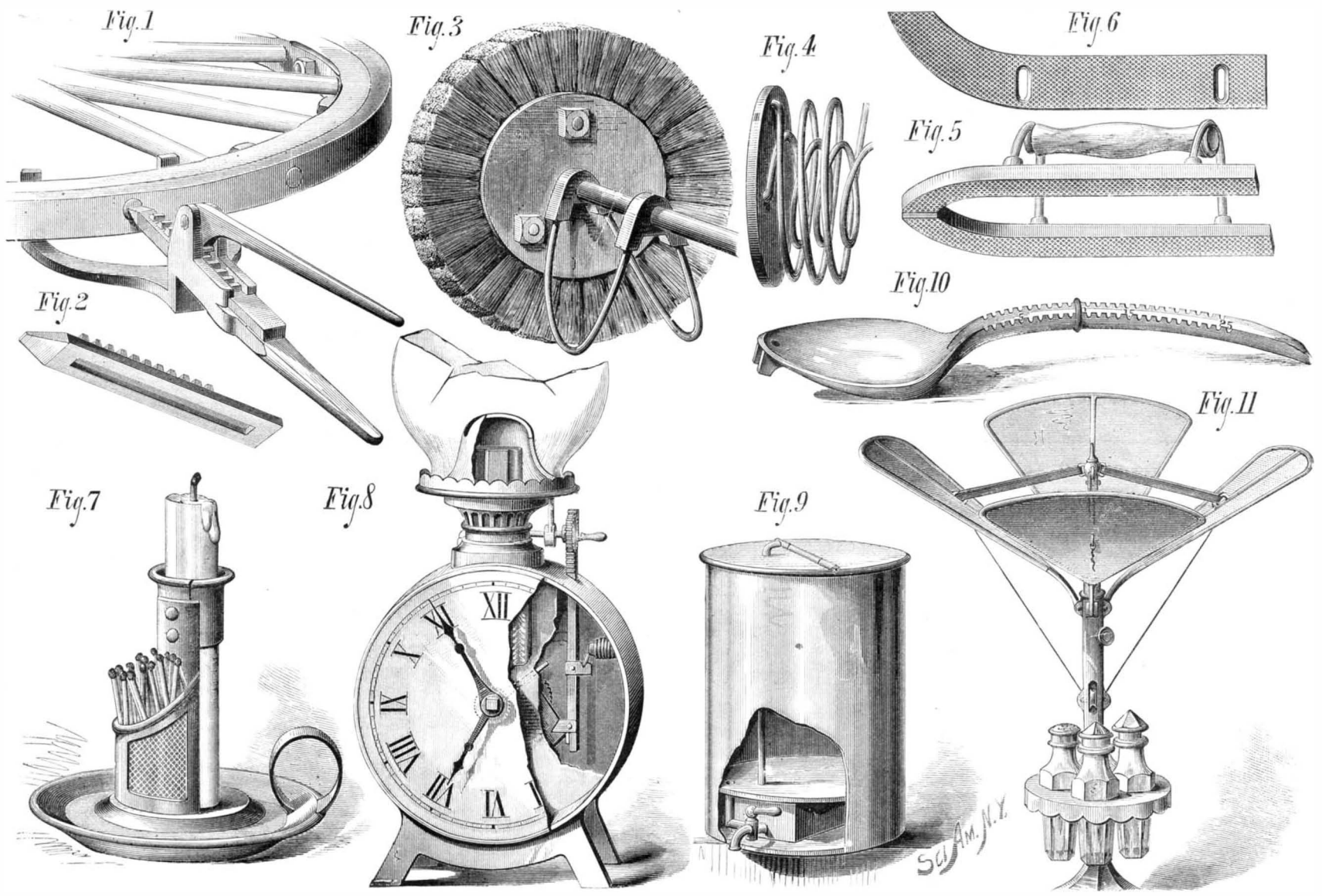
A novel fire escape ladder, which is so contrived that it may be easily and quickly extended to any desired height and secured, and may be contracted into very compact form for transportation or storage, has been patented by Messrs. La Fayette Twitchell and John A. Clark, of Elizabethtown, Illinois.

An improved machine for steaming and drying feathers, for the purpose of purifying and renovating them, has been patented by Mr. T. E. Livesey, of Ashley, Ill. This improvement, although very simple, is said to be effective.

Court Plaster.

Soak isinglass in a little warm water for seventy-four hours, then evaporate nearly all the water by gentle heat, dissolve the residue in a little proof spirits of wine, and strain the whole through a piece of open linen. The strained mass should be a stiff jelly when cool. Now stretch a piece of silk or sarsanet on a wooden frame, and fix it tight with tacks or packthread. Melt the jelly, and apply it to the silk thinly and evenly, with a badger hair brush. A second coating must be applied when the first has dried. When both are dry, apply over the whole surface two or three coatings of balsam of Peru. Plaster thus made is said to be very pliable and never breaks.

CEMENT FOR CAST IRON.—Five parts of sulphur, two parts of graphite, and two parts of fine iron filings, are melted together, taking care that the sulphur does not catch fire. The parts, previously warmed, are covered with the cement, reduced to a pasty consistence on a fire, and firmly pressed together. This cement, it is said, is very well adapted to fill out leaks in cast iron vessels.



A FEW PATENTED NOVELTIES.

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THE PARASOL ANTS OF TEXAS.

At a recent meeting of the Philadelphia Academy of the Natural Sciences the Rev. H. C. McCook presented the results of his studies of the habits of the parasol ants of Texas. Two forms of nests were found by him—one that of a mound twenty-one feet long and four feet high, built around the trunk of a double live oak tree, and the second form consisting of twenty or thirty circular, semicircular, and S-shaped elevations, consisting of fresh earth pellets scattered over a flat space denuded of grass. The mound nest resembled a spittoon in shape, having a round entrance on top. This mound, when first seen, seemed to be deserted; but as evening approached hosts of ants of various sizes were seen hurrying out of the open gate into the neighboring thicket, and two long double columns were stretched from the bottom to the very top of the live oak. The ants in the descending column all carried above their heads portions of green leaves, which waved to and fro and glanced in the lantern light, imparting a weird look to the long line of march. They resembled a procession of Lilliputians bearing their banners aloft.

The opening and closing of the great gate to the nest occurs before and after every exit and entrance of ants. Towards evening the gates are gradually thrown open and remain so until morning, when they are again carefully closed. The work is performed by ants of various sizes, who transport particles of wood and fragments of leaves, etc., of proportionate bulks, for the ants themselves vary from one fourteenth to one sixteenth of an inch in length, at least ten distinct castes or sizes having been counted. When the gates are to be opened, the minions, or smaller forms, carry away from the heap particles of sand. Larger ants take bits of refuse, which they deposit a couple of inches from the gate. This process is slow and it takes a long time to accomplish very little. When the whole mass is thus loosened comes the final burst, with soldiers, majors, and minors in the lead, who bear away the rubbish in front of them, which, in a few minutes, is thus cleared away from the gallery and spread around the margin of the gates.

In cutting, the parasol ant grasps the leaf with feet outspread and makes an incision at the edge by a scissors-like motion of its great sickle-shaped, toothed mandibles. It then gradually revolves, cutting as it goes. Carriers on the ground take up the fragments as they fall and carry them to the nest, each piece being loaded up on its edge within a deep furrow which runs along the entire middle line of the ant's head, and is kept in position by prominent spines on the edge of this furrow and on the fore part of the ant's body.

The cutting and carrying was done, as far as was noted, by the smaller ants. The soldiers rarely engaged in this work, but were seen to precede the excursion columns as they moved out of the nest and up the tree, and afterward to return as though only engaged as scouts or pioneers. The principal leaves gathered were those of the live oak, although others were cut and carried off by the ants. These ants are fond of sugar, grain, and tobacco. The use made of the cut leaves is to construct cells, slightly resembling those of the hornet's nest, but more irregular in shape. These cells were contained in the underground caverns, or pockets. Within these caverns great numbers of the smaller castes of ants were found.

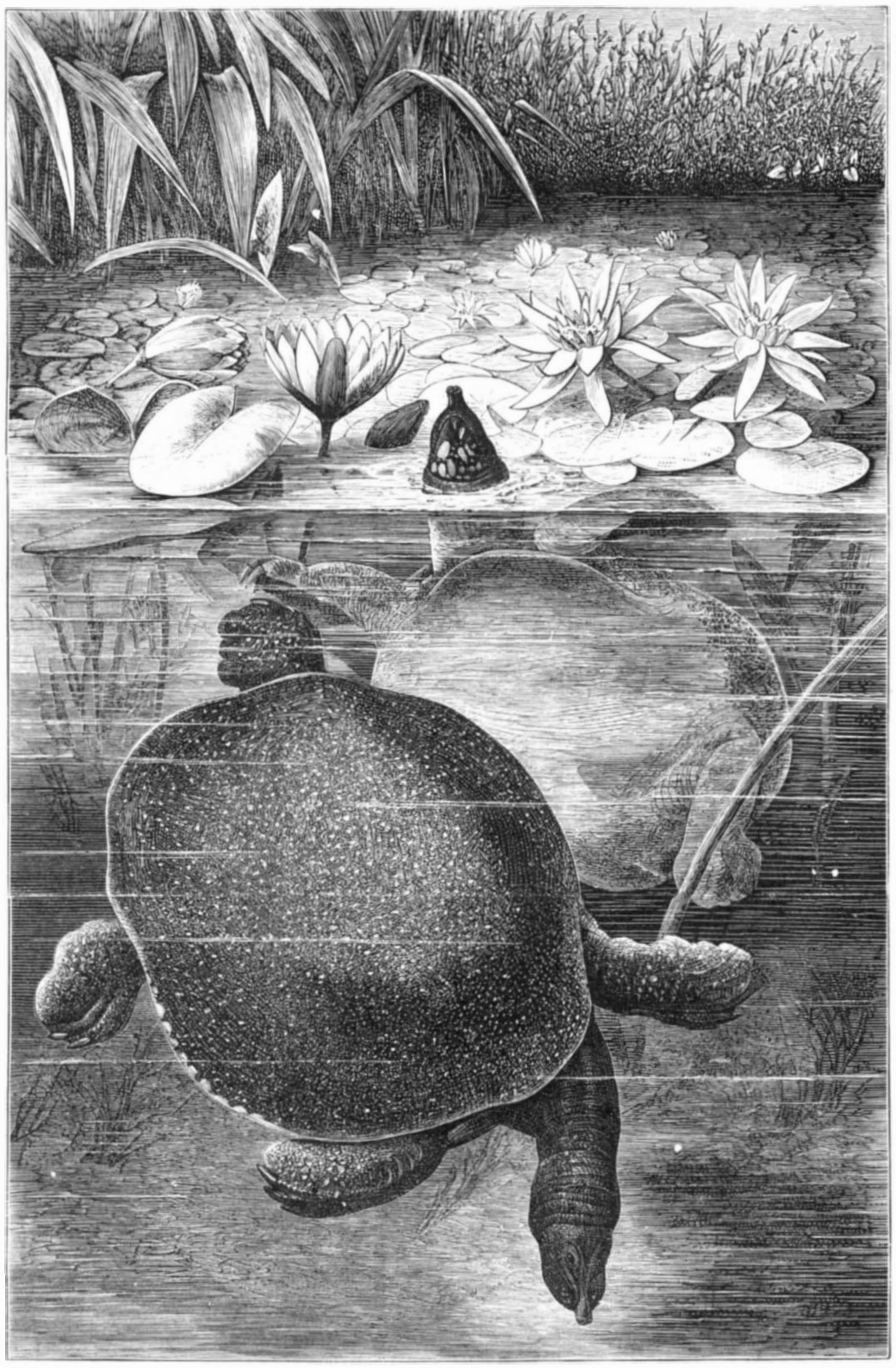
With regard to the opinion of the late Mr. Belt, that these leaf-paper masses were used as a sort of "mushroom garden," a minute fungus being purposely cultivated upon them, which the ants were supposed to use for food, the belief was expressed that this was not correct, but that the ants fed upon the juice of the leaves, the fungi being merely what would naturally grow under the circumstances.

The ability of these ants to excavate vast halls and subterranean avenues was alluded to. Some of the holes examined were nearly as large as the cellar of a small house, and Lincecum's assertion that a tunnel had been excavated under the bed of a stream was pronounced to be not at all incredible.

The digging operations were participated in by the smaller castes only. The large castes would therefore appear to assist in opening the gates, making the excursions, and doing the cutting; the small forms dig and carry out the excavated earth, while the smallest castes assist in opening and closing doors and take care of the larvæ.

These smallest castes, or minions, however, are quite ferocious in the attack and gallantly support the large headed soldiers.

The extreme variation of size found in one nest is one of the most serious special difficulties which the evolution hypothesis has encountered. The variations of domestic cattle by inter-breeding and other results of cultivation, although they throw some light upon the matter, yet require an efficient superintending intelligence which cannot be supposed to operate in the differentiation of ant forms, unless, indeed, we may believe that the evolution hypothesis implies and requires the interposition of a personal intelligence infinitely superior to that of both ant and man.



THE GIANT SNAPPING TURTLE.

Dr. Ruschenberger remarked that these parasol ants in Panama did not confine their operations to the night time, but were seen in long columns transporting leaves during the day also.

Dr. John Le Conte gave an account of the work of these ants in Honduras, where he had known them to excavate a gallery under a roadway into a house. The tiled wall of the house being too hard for them to penetrate, they had tunneled the adobe wall for a foot or more above the floor, and had thus obtained access to the room. Efforts to expel the visitors by the explosion of a mixture of sulphur, saltpeter, and charcoal met with but partial success, and it was only by forcing powdered wood ashes into their gallery and thus neutralizing the formic acid by the help of which they probably carry on their excavations, that their inroads could be in the least prevented.

Dr. Joseph Leidy spoke of the advisability of examining the contents of the stomach of these insects microscopically for the purpose of determining the nature of the food used by them. He was of the opinion that the fungi found in the formicaries were only such as would naturally be found on such vegetable deposits, with the accompanying conditions of heat and moisture.

SAMUEL M. MILLER.

THE GIANT SNAPPING TURTLE.

In the accompanying engraving is represented the North American giant snapping turtle (*Tryonyx ferus*). It attains a weight of about 60 to 80 lbs., and specimens nearly six feet in length have been frequently caught. The back is of dark slate blue color and covered with numerous yellow and reddish dots. The belly is white and the head covered with dark spots. A light band connects the eyes and descends on both sides along the neck to the shoulders. The chin, feet, and tail are marbled white; the iris of the eye is of a bright yellow color.

This turtle inhabits principally, according to Holbrook, the Savannah and Alabama rivers, also the northern lakes, and even the Hudson River; but it is missing in all rivers entering the Atlantic between the mouth of the Hudson and that of the Savannah. Into the great lakes of the North the turtle was probably brought from the great Southern rivers, in which it is indigenous, by the great inundations, by which the Illinois River is brought in connection with Lake Michigan, the Peters River, and Red River. Into the State of New York it probably emigrated through the Erie Canal, as before the completion of the latter it was unknown in New York waters.

In most of these rivers, especially those of the South, this turtle is very common. In clear, quiet weather they appear in large numbers at the surface or on the rocks in the water, sunning themselves. When watching for prey, they hide under roots or stones, and lie motionless, till some small fish, lizard, or even a small water bird, approaches its hiding place. Then the somewhat elongated neck darts out suddenly; it never misses its aim. In an instant the prisoner is swallowed, and the turtle resumes its old position to repeat the same operation, when opportunity offers. They are also great enemies of the young alligators when these are just hatched. Thousands of them are devoured by the voracious turtles, which again fall a prey to such of the grown up alligators as were happy enough to escape.

In May the females select sandy spots along the shore, mounting hills of considerable size if necessity requires it. Here the eggs are deposited. Their calcareous shells are very fragile, more so than those of the eggs of other sweet water turtles. Very little is known of the early life of the young, which are hatched in June.

Among all North American turtles this species is, for culinary purposes, the most valuable, and it is therefore extensively hunted. They are either shot or caught in nets and with the hook. Grown specimens must be handled with great care, as they defend themselves desperately, and can inflict dangerous wounds.

The Latest Snake Story.

Under the above heading, a reporter communicates to one of our daily papers as follows: Mr. Jacob Smith, an undertaker, in Freeport, L I., owns a horse which recently became blind in the right eye—a bluish film completely covering the eyeball. Under this film, playing about in a lively manner, could be distinctly seen something resembling a snake, apparently about three inches long and as thick as a large sized darning needle. It was in constant and rapid motion, having the action of a snake or an eel in the water. A great many people in the neighborhood inspected the phenomenon, which to all was unaccountable. A few days after the snake disappeared as suddenly as it came, leaving the eye totally blind.

Whether the above story is correct or not, similar cases of a worm—*Filaria papillosa Rudolphi*—in the eyes of horses are well authenticated.

The SCIENTIFIC AMERICAN SUPPLEMENT, No. 168, contains an illustrated article on the subject, with engraving of the worm, actual size. A similar parasite has been known to exist also in the human eye.

BY observation and experiment alone can the mind of man arrive at a knowledge of the laws which rule the universe.—*Bacon.*

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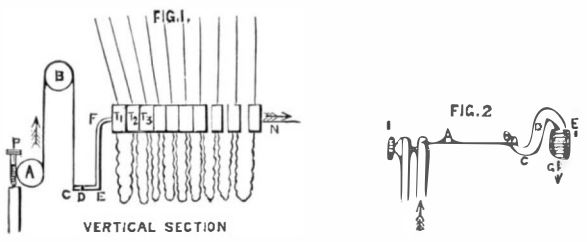
SIEMENS' ELECTRIC CURRENT GOVERNOR.

The idea of employing the stretching of a wire by the heating of the current passing through it was suggested by the early contrivers of electric lamps as a simple means of regulating the distance between the carbons, and it has the advantage that, as the heat produced per second is proportional to the square of the current flowing through it, a very slight change in the current will produce a considerable variation in the quantity of heat produced per second, and, therefore, in the temperature, if the mass of the substance to be heated is very small. On the other hand, when the current diminishes in strength it is necessary that the temperature of the heated substance should immediately fall; this requires considerable radiating surface. These conditions Dr. Siemens has fulfilled in the following instrument, the principle of which is shown in the accompanying engraving, which we extract from the *Electrician:*

A B C is a vertical band of metal not more than a twentieth of a millimeter, or two-thousandths of an inch, thick, passing over the roller, B, one end of the band being fixed to the roller, A, and the other, C, to the short end of a lever, C D E F, turning on a pivot, D. If now, by turning the pinion, P, the thin metallic band is tightened, the upper end, F, of the lever, C D E F, is pressed against the movable metallic terminals, T_1, T_2, T_3, etc., of the resistance coils; the result is, these are pushed out of the vertical and pressed together, and all the coils are short circuited. If now a current, entering at A, and leaving at N, passes through the vertical metallic strip, A B C, the lever, C D E F, and the terminals, T_1, T_2, T_3, etc., it heats the strip, which consequently expands and diminishes the pressure of F on T_1; some of the terminals, therefore, separate from one another, and some of the resistance coils are introduced into circuit (in the engraving six are shown short circuited and three in circuit). Resistance will be automatically introduced until an equilibrated state is arrived at, when the heat lost from the metallic strip, A B C, by radiation, convection, and conduction is exactly equal to that generated by the current, and any further decrease or subsequent increase of the current (provided the change is within certain limits) will be at once checked. To provide against accidental charges in the radiating power of the strip, produced by currents of air, etc., the portion, A B C, is under a glass cover.



SIEMENS' GOVERNOR.

In some trials made with this instrument before the Royal Society it was shown that the interposition of a certain resistance into the circuit only altered the deflection of a tangent galvanometer from 40° to 39·5°, when the regulator was employed, whereas, without it, the insertion of the same extraneous resistance diminished the deflection from 60° to 40°.

Fig. 2 shows another form of governor proposed by Dr. Siemens. The wire, A B, is stretched until the lever, C D E, turning on the pivot, D, produces sufficient pressure on a pile of Edison carbon disks in the glass tube, G. This pressure becomes less, and the resistance of the carbons becomes greater the more the wire stretches by heating with the current passing through it and through the carbon disks; the stronger, therefore, is the current the greater is the resistance opposed to it.

Either of these instruments may be used as a recorder of the electric current by attaching a pencil to the lever and allowing it to make a continuous mark on a strip of paper moved by clockwork at right angles to the direction of motion of the lever.

A Reptile which Lived Twelve Million Years Ago.

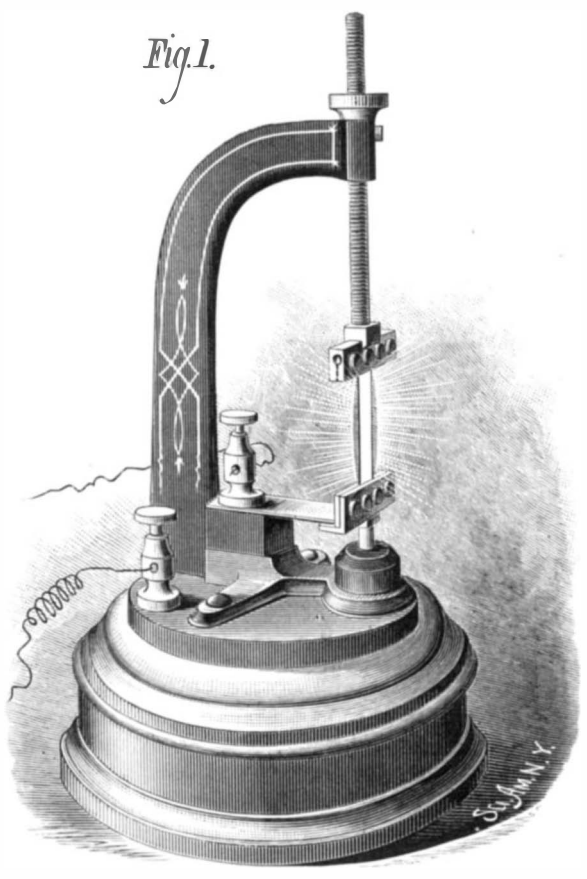
The American Museum of Natural History, of this city, has just been enriched by a contribution of three slabs of sandstone taken from the Connecticut Valley. The donor of the slabs desires that his name shall not be mentioned in print, but the specimens are said to have come from Turner's Falls, Mass. On two of the slabs are impressed large foot prints of some amphibious animal. Professor Hitchcock names the animal the *Brontozoum giganteum.* The beast is, or was in ancient times, a reptile of enormous size, as the prints of his feet on the slabs presented to the museum show. The theory of the geologists is that this monster was formed something like a frog; that he walked mostly on his hind legs, only using his fore legs when it was necessary for him to drop down to rest. It is estimated that he lived about 12,500,000 years before the appearance of man on this earth.

The third slab is covered with the marks of the feet of some insect which is unknown to the present generation. From the foot prints the geologists have determined that the insect was of the *ephemana* genus. Insects of this class can live in the water several days, but on the land they survive for but from one to twenty-four hours. The theory regarding these foot prints is that the insect found himself on dry land, with the tide receding, and in attempting to gain the water he left these marks upon the sand, which are presumed to teach the nineteenth century something of the history of the past.

NEW ELECTRIC LAMP.

To the Editor of the Scientific American:

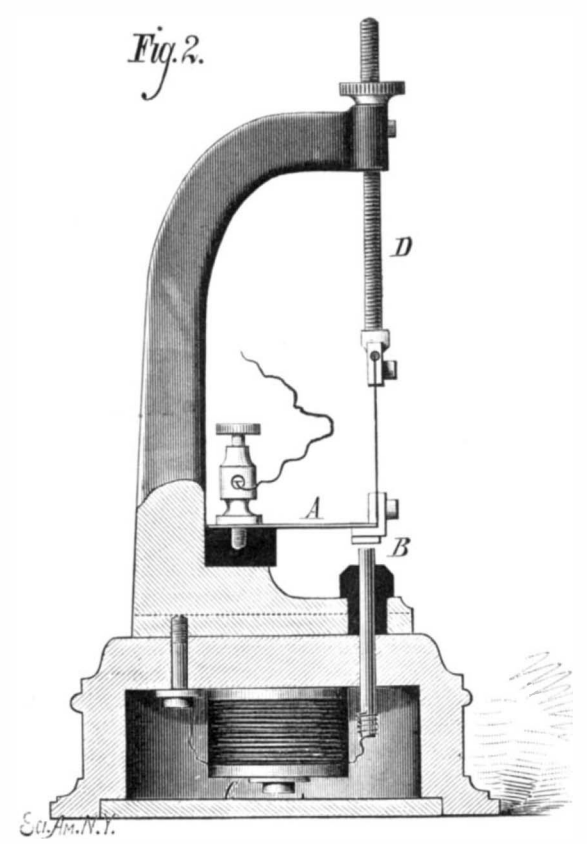
I notice in a recent paper a cut of Mr. Edison's platinum lamp. This lamp is so like one I made about two years ago, that I send you mine, and hope you will find a place for it



in your paper. Upon a careful examination of the two you will see that they both have the following features in common, namely: 1. The light is produced by a band of incandescent metal. 2. The metal is held taut by a spring. 3. The current is shunted by the expansion of the metal producing the light. 4. The shape of the metal is the same. 5. The contact points of the shunt are tipped with platinum. 6. The degree of expansion before the current is shunted is regulated by a screw.

The only thing not common to both is, I had a resistance coil in the shunt. Now, as I never saw Edison and he never saw me, how did it happen that we both made the same thing and almost exactly alike, except in the shape of minor details?

I never applied for a patent on my lamp, from the fact that I found from experiment that it required a very much greater expenditure of power to produce a given light with it than was required with the carbon points, so I put it on the shelf. Its operation is so simple that you need no explanation to understand it. I made the model represented in the engraving during the summer or fall of 1877; I have the original drawing. I first tried it on 35 cups Bunsen, as I



had no magneto machine then. About one year ago I took the resistance coil out of the base to use for another purpose. When I tried it again I run the wires outside of the case and used a rheostat. I afterward cut them off and connected them inside, so that for the last 10 or 12 months it has been in principle just exactly like Edison's lamp. I look upon the matter as a remarkable coincidence. HIRAM S. MAXIM.

Bridgeport, Conn., February 26, 1879.

[Fig. 1 shows Mr. Maxim's lamp in perspective; Fig. 2 is a vertical section. The spring, A, which clamps the lower end of the platinum strip, is secured by a binding post to a vulcanite block attached to the base of the iron standard. An insulated platinum tipped rod, B, extends through the base of the standard, and is connected with one terminal of a resistance coil, C, concealed in the base. The other terminal of the coil is in electrical communication with the iron standard. A threaded rod, D, extends downward through the upper end of the standard, and has at its lower end a clamp for holding the upper end of the platinum strip. The rod, D, is adjusted by the nut which bears on the top of the standard, so that when the platinum foil is cool the spring, A, does not touch the rod, B.

One electric wire being secured in the binding post that holds the spring, A, and another being connected with the vertical standard, the current passes through the spring, A, the platinum strip, the rod, D, and the vertical standard, heating the platinum to incandescence. Should the current increase so as to bring the temperature of the platinum nearly to the melting point, the strip expands until the spring, A, touches the end of the rod, B, when a portion of the current passes through the resistance coil, C.

When the temperature decreases the platinum contracts and breaks the contact between A B.]

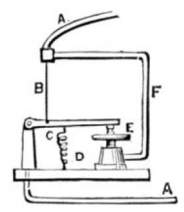
Cement for Glass.

Take 10½ lb. of pulverized stone and glass and mix with it 4¾ lb. of sulphur. Subject the mixture to such a moderate degree of heat that the sulphur melts. Stir until the whole becomes homogeneous, and then run it into moulds. When required for use it is to be heated to 248°, at which temperature it melts, and may be employed in the usual manner. It resists the action of acids, never changes in the air, and is not affected in boiling water. At 230° it is said to be as hard as stone.

EDISON'S ELECTRIC LIGHT.

A correspondent of the *Electrician* gives the following description of Edison's regulator:

His sheet of iridio-platinum is rigidly affixed, at the top, to a crossbar, to which is attached one wire. The crossbar at the bottom, to which the lower edge of the sheet and the other wire are attached, is a lever drawn down by a spring. Underneath this lever is an adjustable screw, tipped with platinum. From the standard of this screw runs a shunt wire to the top of the sheet. As the sheet is heated it expands, and the spring on the lever draws it down. The shunt screw is set to the desired degree of heat (light), and when this is reached the lever is in contact with the screw, and the current is shunted out of the sheet. In practice, this contact is being constantly made and broken. There you have the key to this "wonderful" performance.



A A, conducting wires; B, edge of illuminating sheet; C, lever; D, spring; E, shunt post; F, shunt wire.

Ocean Beach (Cal.) Placer Mines.

At a meeting of the San Francisco Academy of Science, Mr. Christy reports that in the black sand beach placer mines of California, the gold is found in the layers of magnetic iron sand which alternate with layers of common quartz sand; also in the gravelly layers swept by the surf. Hard pan is reached at a depth of two to four feet. It is composed of a sort of clay sandstone, and upon the "hard pan" is usually found a layer of coarser sand or granite, which is usually the best pay dirt found. Some of the higher layers of black sand are quite rich also. Under the microscope the black sand shows itself to be composed of more or less perfectly rounded grains of magnetic oxide of iron, with a few silica grains and occasional fragments of what appears to be garnet. Mixed with the sand is the gold, which, under the microscope, is usually bright, and in only a few cases presents a rusty appearance. The gold is invariably in the form of oblong or elliptical scales, which are doubly concave and usually surrounded by a thickened rim. Another curious fact is the great purity of the gold, which has been reported to have assayed from 950 to 953 fine, and is said to be the purest placer gold ever found in California.

Thrift of the French Working Classes.

The most striking fact with regard to the French working classes is that nearly all are possessed of money. However little they earn they save something. Thrift is their great characteristic; in fact, it is said of the French operatives that they spend less in proportion to their means than any in the world. Many keep their accumulations in an old stocking secreted in their houses; others—a daily increasing number—invest in various securities, the most popular investment being the purchase of land. Every Frenchman, when he can, becomes the owner of the house in which he lives. Of course he is greatly aided in this by the French land laws and laws of inheritance, which cut the whole country up into small holdings. Savings banks with government security, building clubs, sick clubs and friendly societies are also in favor; but no money is tied up in trade unions.

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THE EDISON ELECTRIC LIGHT.

The following is an abstract from an article describing Edison's electric light, which appeared in a late issue of the *Engineer:*

We publish herewith accurate copies of the three principal drawings of Edison's electric light apparatus lodged with the French specification, and we have no doubt that they are in all respects identical with those which accompany all the applications which Mr. Edison has made in other countries for a patent. He has used in all no fewer than forty-eight figures to render the nature of his inventions clear; but the great majority of them represent comparatively insignificant modifications of the ideas illustrated by our engravings, and consequently we have not thought it necessary to reproduce them.

The invention is divided into two parts—the first refers to the means of producing electricity, the second to the lamp.

The electro-magnetic machine is thus described in the specification:

"It has long been known that if two electro-magnets, or an electro-magnet and a permanent magnet, be drawn apart or caused to pass by each other, electric currents will be set up in the helix of the electro-magnet. It has also been known that vibrating bodies, such as a tuning-fork or a reed, can be kept in vibration by the exercise of but little power. I avail of these two known forces, and combine them in such a manner as to obtain a powerful electric current by the expenditure of a small mechanical force. In Fig. 1 of the drawing a tuning fork, *a*2, is represented as firmly attached to a stand, *b*2. This fork is preferably of two prongs, but only one might be employed upon the principle of a musical reed. The vibrating bar or fork may be two meters long, more or less, and heavy in proportion. It has its regular rate of vibration like a tuning fork, and the mechanism that keeps it in vibration is to move in harmony. A crank and revolving shaft, or other suitable mechanism, may be employed, but I prefer a small air, gas, or water engine, applied to each end of the fork. The cylinder *a*1 contains a piston and a rod, *b*1, that is connected to the end of the bar, and steam, gas, water, or other fluid under pressure acts within the cylinder, being admitted first to one side of the piston and then the other by a suitable valve; the valve and directing rod, *c*2, are shown for this purpose. The bar of fork, *a*2, may be a permanent magnet or an electro-magnet, or else it is provided with permanent or electro-magnets. I have shown an electro-magnet, *c*1, upon each prong of the fork—there may be two or more on each—and opposed to these are the cores of the electro-magnets *d*. Hence as the fork is vibrated a current is set up in the helix of each electro-magnet, *d*, in one direction as the cores approach each other, and in the opposite direction as they recede. This alternate current is available for electric lights, but if it is desired to convert the current into one of continuity in the same direction a commutator is employed, operated by the vibrations of the fork to change the circuit connections each vibration, and thereby make the pulsations continuous on the line of one polarity. A portion of the current thus generated may pass through the helixes of the electro-magnets, *c*1, to intensify the same to the maximum power, and the remainder of the current is employed for any desired electrical operation wherever available. I, however, use the same, especially with my electric lights, but I remark that electricity for such lights may be developed by any suitable apparatus. I have represented commutator springs or levers, *c*3, *c*4, operated by rods that slide through the levers, *c*3, *c*4, and by friction move them. When the prongs, *a*2, *a*2, are moving from each other the contact of levers, *c*3, *c*4, will be with the screws, 40, 41, and the current will be from line 1, through *c*1 to *c*, thence to *c*3 to 41, 43, and to circuit of electro-magnets, *d d*, and from *d d* by 42 to 40, *c*4, and line as indicated by the arrows. When the prongs, *a*2, *a*2, are vibrating towards each other the circuit will be through *c*1, *c*, *c*3, 42, in the reverse direction through the circuit and magnets, *d d*, back to 43, and by *c*4 to line."

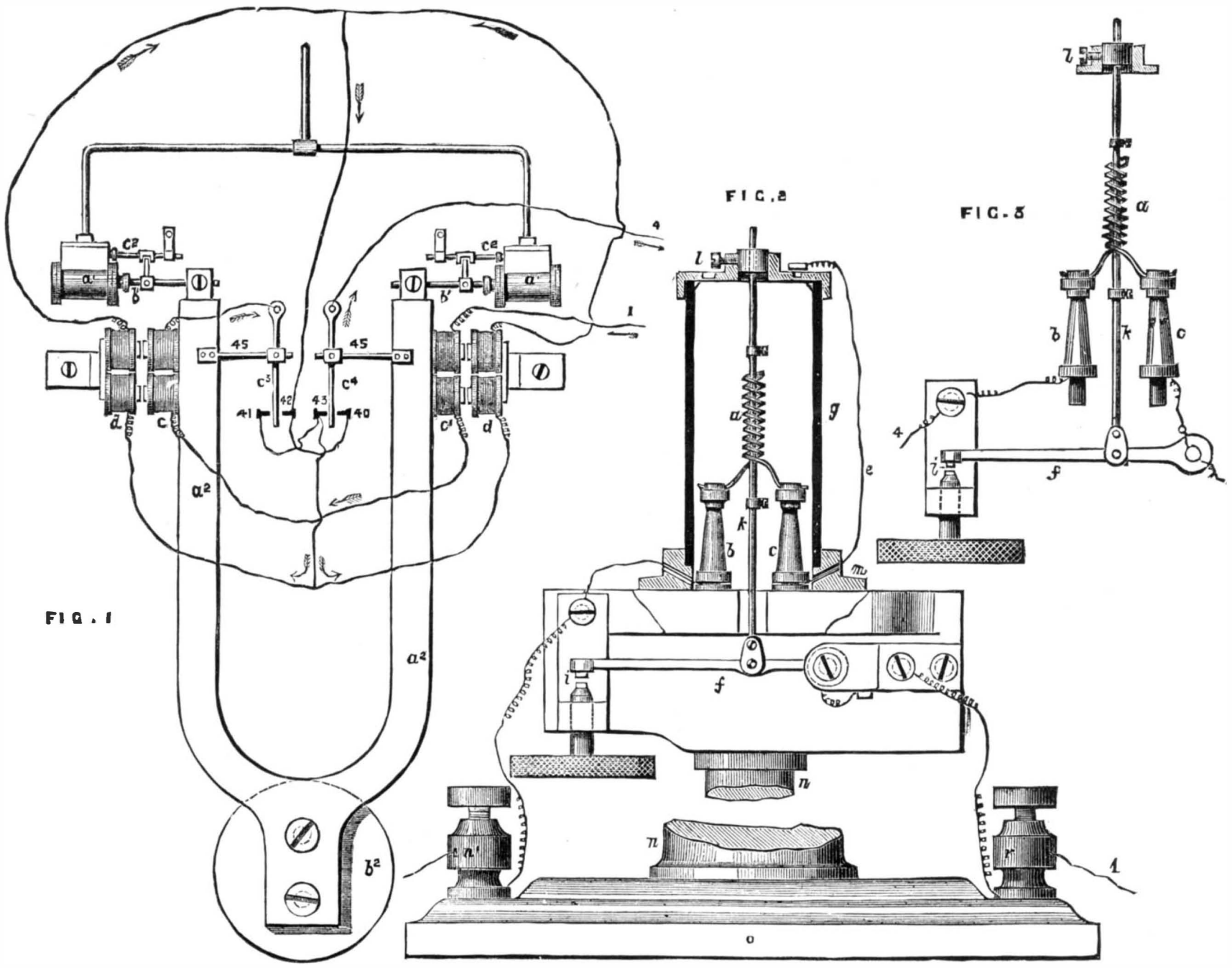
Fig. 2 shows the Edison lamp, which is thus described by the inventor:

"Platinum and other materials that can only be fused at a very high temperature have been employed in electric lights; but there is risk of such light-giving substance melting under the electric energy. This portion of my invention relates to the regulation of the electric current, so as to prevent the same becoming so intense as to injure the incandescent material. The current regulation is primarily effected by the heat itself, and is automatic. In Fig. 2 I have shown the light producing body as a spiral, *a*, connected to the posts, *b c*, and within the glass cylinder, *g*. This cylinder has a cap, *l*, and stands upon a base, *m*, and for convenience a column, *n*, and stand, *o*, of any suitable character, may be employed. Most of the other figures are in the form of diagrams to more clearly represent the electrical connections. I remark that it is preferable to have the light within a case or globe, and that various materials may be employed, such as alum water, between concentric cylinders, to lessen radiation, retain the heat, and lessen the electric energy required; or colored or opalescent glass, or solutions that reduce the refrangibility of the light, such as sulphate of quinine, may be employed to moderate the light, and the light may either be in the atmosphere or in a vacuum. The materials that I have found especially adapted to use as light-giving substances are set forth hereafter. The electric circuit, Fig. 2, passes by line 1 to the post, *r*, and by a wire to the lever, *f*, thence by the wire or rod, *k*, cap *l*, wire, *e*, to the post, *c*, through the double spiral, *a*, to the post, *b*, and by a metallic connection or wire to the post, *n*1, and line 4, and so on through the electric circuit, and the light be developed in *a*. The rod, *k*, will expand in proportion to the heat of the coil, or in proportion to the heat developed by the passage of the current through the fine wire, *k*, and, if the heat becomes dangerously high, injury to the apparatus is prevented by the expansion of rod, *k*, moving the lever, *f*, to close the circuit at *i* and short circuit or shunt a portion of the current from the coil, *a*, and reducing its temperature; this operation is automatic, and forms the principal feature of my invention, because it effectually preserves the apparatus from injury. The current need not pass through the wire or rod, *k*, as the expansion thereof by the radiated heat from the coil, *a*, will operate the lever, *f*, as indicated by Fig. 3, but the movement is not so prompt. It is to be understood that in all cases the action of the short current through the light-giving substance and the circuit-closing devices play up and down at the contact point, maintaining uniformity of brilliancy of light."

Most of the details of this invention, taken separately, are not new. The use of an incandescent substance was first patented in this country, not by King in 1845, as is generally believed, but by De Moleyns in 1841. The materials named by Mr. Edison, such as platinum, iridium, osmium, etc., have all been used or proposed to be used long since. In this direction, therefore, there is nothing about Mr. Edison's invention to encourage hope or excite fear. There remains, however, the device for protecting the incandescent material from overheating, and this is very pretty and ingenious, and will probably work very well in competent hands; but it is a delicate bit of mechanism, which must not only be adjusted to begin with, but kept in adjustment with minute accuracy, or the wire coils will be destroyed or the light will go out. Mr. Edison will no doubt attain much success at Menlo Park, where everything will be under his own control; but for the ordinary purposes of lighting our houses an electric lamp has probably yet to be invented.

With all its defects for domestic purposes, still Mr. Edison's lamp might perhaps be used to much advantage for street lighting, and in factories or theaters; in fact, in any situation where it could be looked after by a skilled attendant.

We reproduce the following portion of Mr. Edison's spe-



EDISON'S NEW ELECTRIC LIGHT APPARATUS.

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cation, omitting the figures and the references to them, as we fancy the passage will be intelligible without them: "In lighting by electricity it is often important to use a secondary battery in connection with the main current. Electric light coils may be put in a secondary circuit containing cells, with plates in a conducting liquid; and a lever is vibrated by an electro-magnet or by clock-work. When the lever is in contact the current from line 1 passes through the electro-magnet and cells, but when the contact ceases the line is closed, but a local circuit is made through the coils and secondary battery; the discharge of the secondary battery gives the light, and the movement is so rapid that the light appears continuous. A single secondary battery may be introduced with one or more lights, the expansion of the light-giving material short circuiting the current through the secondary battery. Instead of a rheostat in the shunt circuit I sometimes employ a button of carbon. In this case the spring lever bearing upon the carbon button lessens the resistance by the increase of pressure, as the platina strip expands, and as it contracts and lessens the pressure on the carbon button the resistance of that carbon button increases, and a greater portion of the current is sent through the platina strip. This regulation is very accurate."

Mr. Edison's claims are as follows: "(1) The combination with an electric light of a thermal circuit regulator, to lessen the electric action in the light when the maximum intensity has been attained, substantially as set forth; (2) The combination with the electric light of a circuit closing lever, operated by heat from the electric current or from the light, and a shunt or short circuit to divert the current or a portion thereof from the light, substantially as set forth; (3) The combination with the electric light and a resistance of a circuit closer operated by heat, and serving to place more or less resistance in the circuit of the electric light, substantially as set forth; (4) The combination with an electric light of a diaphragm operated by the expansion of a gas or fluid in proportion to the temperature of the light to regulate the electric current, substantially as set forth; (5) The combination with a vibrating body similar to a tuning fork of mechanism for maintaining the vibration, and magnets, cores, and helixes, whereby a secondary current is set up, so as to convert mechanical motion into electric force, or the reverse, substantially as set forth; (6) The combination with electric lights, substantially such as described, of means for regulating the electric current to the same, in proportion to the heat evolved in the light, so as to prevent injury to the apparatus, substantially as set forth."

In all this it will be seen that we have not one word concerning any new or extraordinary contrivances for dividing the electric light. Mr. Edison has many other patents in progress, but that with which we have just dealt is, no doubt, *the* patent; that which has attracted more attention, and the publication of the contents of which has been looked for with more avidity than perhaps any other ever applied for in England. How far it justified the hopes and fears which have been fostered concerning it, we have placed our readers in a position to judge for themselves. It may not be improper to say before concluding, that Mr. Edison's complete specification has not yet been filed in this country, and cannot be seen at the Great Seal Patent Office, or anywhere else save Paris.

RIGHI'S TELEPHONE.

Professor Augusto Righi, Professor of Physics at Bologna, began his experiments with the following described instrument in December, 1877, and on the 14th of March, 1878, exhibited the apparatus in working order before the Academy of Sciences of Bologna.

The receiving telephone of Professor Righi differs but little from the old Bell telephone; the Righi instrument has a larger and stronger magnet, and the iron disk is secured in the middle of a sheet of parchment paper placed at the mouth of a wide funnel. This arrangement results in the delivery of very clear and strong sounds. But results that are quite satisfactory may be obtained with an ordinary Bell telephone by substituting for the membrane a thin sheet or veneer of wood.

Professor Righi's transmitter is entirely different. It contains a conducting powder, which is more or less pressed upon by the vibrating body, and as the conductivity of the powder varies with the pressure, the intensity of the electric current which passes will be relatively varied with the vibrations, and the receiver, if placed in the circuit, will reproduce the sounds. It is interesting to study the advantages which the use of pulverized conductors present.

If the current from a pile passes through a galvanometer and through a powder contained in a tube of glass, it is easy to demonstrate that the intensity of the current depends on the condition of the powder. The deviation of the needle will be in proportion to the pressure applied to the powder. Whatever the character of the powder, if it is not fine, the variations of intensity are small and irregular; if, on the contrary, it is very fine, the intensity of the current increases with the pressure regularly and without any interruption. Different effects will be produced, according to the character of the powdered material which is employed. Thus, if silver be reduced to an impalpable powder, after having been compressed, it retains in part the new disposition of its particles, for it will be found that the compressing piston no longer touches the powder when it returns to the position it was in before the current was closed.

On the contrary, with very fine graphite, when the pressure is diminished, the current shows anew the same intensities which it had before in the same positions of the pressing piston when it was being moved to give pressure. The effects which other powders produce resemble more or less those of silver and graphite.

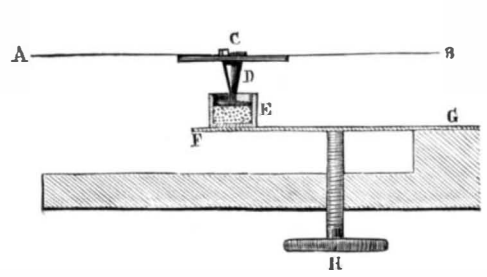
The author does not know in virtue of what force the powder tends to assume its primitive condition when the pressure is diminished. It might be called the elasticity of readjustment.

The possibility of transmitting very acute sounds with certain powders shows that this elasticity is sufficiently active to permit the powder rapidly to acquire the same condition which it had before being compressed. It may be also that this elasticity of readjustment, which is perfect in some powders, is due to the elasticity of the atmosphere of gas which adheres to the particles of the powder.

We know that there are solid bodies which operate in a manner analogous to these powders, and that they have been employed in the construction of transmitting telephones; such are the retort carbons, iron, and graphite. In these bodies the variations of conductivity obtained by pressure are less than with powders, but in all cases they are produced by extremely small movements of the vibrating body. Very strong sounds cause a complete and periodical separation of the metal which compresses the carbon, thereby producing loud rumblings in the receiver, which prevents the understanding of the transmitted words. In order that the circuit may not be opened by the vibrations, it is necessary to increase the pressure upon the carbon or diminish the mobility of the vibrating body which produces the pressure; but in that case we experience considerable loss in the intensity of the sounds; hence the necessity of frequent adjustment by means of the screw. On the other hand, it is found that the strong disagreeable rumblings are produced by the loosening of the particles of the carbon during the vibrations.

With this class of telephones, and also with those of Bell, it is necessary to place the receiver close to the ear in order to understand the transmitted words.

With the pulverized conductor these inconveniences are avoided. It is much more flexible than the carbon, and we are able to use in connection with it a body which easily vibrates, and in which the vibrations will have much amplitude without opening the circuit; and as the variations of the resistance of the powder are very great, the sounds which the receiver reproduces are very intense.



THE RIGHI TELEPHONE.

In this transmitter, a membrane of parchment paper is vibrated by the sound waves, but a metallic sheet or a membrane of wood may be used. In the center of the membrane, A B, is fixed a piece of metal, C D, the lower end of which has the form of a flat piston, and rests upon the powder contained in the thimble, E. The spring, F G, carries the thimble, E, and the elastic force of the spring is regulated by a screw, H. When the pressure upon the powder is once adjusted, which is easily done, the apparatus will work for a long time without readjustment. If in an electric circuit we place a galvanometer and a transmitter such as we have described, and if with the finger we press upon C, in the direction C D, it will be observed that the needle remains almost stationary. In fact the spring, F G, yields, while the pressure upon the powder is scarcely changed. This proves that the jarring, shaking, or bending of the wood of the apparatus does not involve the necessity of adjustment by means of the screw, H.*

Every kind of pulverized conductor will answer more or less well in a transmitter; but that which has given the author the best results is a mixture of carbon or plumbago and silver, very finely pulverized. The results obtained depend very much on the quality of the graphite. In order to communicate between two points it is desirable to place at each of them a transmitter and a receiver, also a battery.

A battery composed of from one to four Bunsen couples is sufficient, or an equivalent number of couples of Leclanche or other system.

The three instruments are arranged in one circuit between the line and the earth.

It is better to throw the transmitter out of the circuit when receiving, as it will be a useless resistance in the circuit. In every case the one who listens is able at all times to interrupt the one who speaks by sending sounds or words.

The intensity of the sounds delivered by the receiver depends upon the intensity of the current and the total resistance of the circuit. Over a distance of two or three kilometers, and with four small Bunsen pairs, the voice of a person who speaks at one of the ends of the line will be understood at the other end at a distance of six to nine feet from the receiver. Singing and the sounds of musical instruments will be heard perfectly at a distance of twenty-five or thirty-five feet, and sometimes even further. If at the hearing station two or more receivers are used, they may be so arranged that a large number of persons may simultaneously hear what is being said.*

In order to transmit speech or other sounds, it is not necessary to produce them close to the transmitter; words spoken at a distance of several feet from the instrument are heard perfectly at the other end of the line. Effects especially notable have been obtained over lines of considerable length;† but the resistances are very easily overcome by employing the induction coil. For this purpose it is necessary to have: 1, a transmitter; 2, a receiver; 3, an induction coil; 4, a battery. The large wire of the coil, the receiver, and the transmitter (when sending), form a closed circuit with the battery. The fine wire of the coil communicates at each station with the line wire at one end and with the ground at the other end. Thus arranged, the variations of intensity which the transmitter produces at one of the stations, gives rise to induced currents in the fine wire of the induction coil, which are propagated along the line to the fine wire of the coil at the next station; at which place, by secondary induction, variations of intensity in the local current will be determined, and the receiver will be correspondently affected. It is in this manner that the latter instrument reproduces the sounds. The voice of a person speaking is heard at a distance of some six feet from the receiver even when the line has interposed resistances amounting to hundreds of kilometers; the louder sounds of the instrument are heard at a still greater distance. But it must not be forgotten that there is a difference in the effects, as between an artificial resistance and that of a regular line, particularly in view of the imperfect insulation of the latter.

The clearness and intensity of the sounds obtained with the telephone we have described, permit the hope of its useful applications both for civil and military purposes.

* Many of these instruments, sent by railway from Paris to Bologna, operated very well on their arrival, without the necessity of touching the regulating screw.

THE MEXICAN INDUSTRIAL EXHIBITION.

It has been announced officially at the City of Mexico that the proposed Industrial Exhibition of the products of Mexico and the United States will open on Jan. 15, next year (1880). The construction of the building has been begun already. The Department of Public Works is acting with energy in the matter. Full information will be promptly furnished to American manufacturers and the press. President Diaz is resolved that nothing shall be left undone to make the exhibition successful and advantageous to the industries of Mexico and the United States.

The Western merchants, who lately started on a commercial mission to Mexico with so much enthusiasm, returned less confident of a speedy development of trade with that country. Trade revolutions are not brought about simply by willing them. New markets have to be won by patient effort, not less in educating new customers than in learning how to supply wants already existing. Exhibitions like the one proposed may help wonderfully in both directions; and it is to be hoped that the efforts of President Diaz will not go unseconded here.

THE AGRICULTURAL EXHIBITION IN LONDON.

The Royal Agricultural Society of England will hold a great agricultural show in London, June 30 to July 7 next. Special efforts are making to insure a successful exhibition. Several classes are open to American competition. Entries must be made on printed forms, to be obtained of the secretary of the society, Mr. H. M. Jenkins, No. 12 Hanover Square, London, W., England. No entry fee is required for American exhibitors. In view of the importance of England as a market for American farm produce, the advantage of being well represented at the coming exhibition need not be enlarged upon. In most cases the entries must be made by producers and owners, so that farmers cannot rely on dealers and exporters to make a display for them.

Improvement in the Iron Trade.

The iron trade shows a decided upward tendency; prices are advancing, and the demand is better than for several years. A Philadelphia paper reports that all the Pennsylvania rail mills are full of work, while structural iron is in such demand that many of the larger mills are engaging other mills to fill their orders. Most of the producers of steel rails in that State already have their production sold for months ahead. One mill lately had to decline an order for nearly 20,000 tons at favorable prices owing to inability to fill it. The demand for sheet iron and bar iron is also strong. It is further reported, on the authority of one of the largest machine tool establishments in Philadelphia, that the demand for heavy machinery is greater than for several years past.

* On the evening of April 27, 1878, with two receivers, which had been placed in one of the saloons of the Society of Arts of Milan, more than 500 persons were enabled to hear the sounds and voices produced at a distant station. In the same manner, on the evening of August 27, 1878, during the lecture of Professor Cornu, in the grand amphitheater of the Conservatory of Arts and Artisans of Paris, all present were able to hear the singing and the sounds produced in a saloon situated at a great distance, which were reproduced by means of two receivers suspended in the amphitheater.

† On the evening of April 7, 1878, an experiment was made on a telegraph line between Bologna and Ferrara, which is 154 miles long. The numerous auditors assembled at each end of the line were enabled to hear perfectly the sounds, the words, the songs, which were emitted from the opposite station. In the experiments made in Bologna, Ferrara, Milan, Pavia, and lastly in Paris before the Physical Society, the Academy of Sciences, at the Exhibition, etc., the resistances of the lines were much less.

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TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Steam Tug Machinery, Engines, Boilers, Sugar Machinery. Atlantic Steam Engine Works, Brooklyn, N.Y.

Jarvis Patent Boiler Setting, same principle as the Siemens process for making steel; burns screenings and all kinds of waste fuel, without blower. A. F. Upton, Agent, 48 Congress St., Boston, Mass.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

Try the new fragrant Vanity Fair Cigarettes, both plain and halves. Most exquisite of all.

Save Fuel by using Steam Boiler Damper Regulator. National Iron Works, New Brunswick, N. J.

Gold, Silver, and Nickel Plater wants situation. Address Plater, Oakville, Conn.

Small Metal Tubing; Gold and Silver Plated Metal; Hard Solders. J. U. Gerow, 44 State St., Brooklyn, N.Y.

Engines, ½ to 5 H. P. G. F. Shedd, Waltham, Mass.

Manufacturers of Bag Fasteners will please address, with circular, P. O. Box 757, Carbondale, Penn.

Vertical and Yacht Engines. F. C. & A. E. Rowland, New Haven, Conn.

Patents Sold on Commission.—Describe patent and inclose stamp. Address W. Taft, Tolland, Conn.

Auction Sale.—The well known Hardie's Machine Works, 62 Church St., Albany, N. Y., will be sold March 26, at noon. Address as above for circulars.

Greatest improvement of the age in Artificial Limbs. Perfect-fitting Elastic Limbs of pure dental rubber, made on fac-simile cast of natural limb. Great strength, elasticity, durability, lightness. Address C. T. Mason, Jr., 1320 Chestnut St., Philadelphia.

Amateur Photo. Apparatus, including instructions; outfits complete. E. Sackmann & Co., 278 Pearl St., N.Y.

Wanted—Brown & Sharp Universal Milling Machine, Lathe 36-inch swing, planer about 6-ft. bed, upright drill; all second hand. Address Box 4055, N. Y. P. O., with full description and lowest price.

80 H. P. Corliss Engine for sale low, by J. F. Bishop, New Haven, Conn.

New Gear Cutting Attachment for Lathes. Lace Leather Cutter. Something new. Send for lists. Jackson & Tyler, Baltimore, Md.

Outfits for Nickel and Silver Plating, $5 to $200. Union Silver Plating Company, Princeton, Ill.

Send for Circulars of Indestructible Boot and Shoe Soles to H. C. Goodrich, 40 Hoyne Ave., Chicago, Ill.

For Sale cheap.—3 H. P. Yacht or Stationary Engine and Boiler, good as new. Aug. Franke, Wapakoneta, O.

Kinney Bros.' New Cigarette, Sweet Caporal, fine, mild, and sweet, are becoming extremely popular everywhere.

Wanted.—Information of any improved method or machinery for making Vinegar. Address 909 N. 23d St., St. Louis, Mo.

Want—3 Singer Sewing Machines; 1 Watchman's Time Detecter. Address Millstone, Indianapolis, Ind.

Brown & Sharpe, Prov., R. I. Best Gear Teeth Cutters and Index Plates at low prices. Send for catalogue.

For Sale.—Brown & Sharp Universal Milling Machine; Bement Profiling Machine; first-class 2d hand Machine Tools. E. P. Bullard, 14 Dey St., New York.

For Sale.—7 foot bed Putnam Planer, $350. A. A. Pool & Co., Newark, N. J.

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Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St. N.Y.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2,318 Frankford Ave., Phila.

Shaw's Noise Quieting Nozzles and Mercury Pressure Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

H. Prentiss & Company, 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Case Hardening Preparation. Box 73. Willimantic, Ct.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

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Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Galland & Co.'s improved Hydraulic Elevators. Office 206 Broadway, N.Y., (Evening Post Building, room 22.)

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d & Wood St., Phila., Pa.

Inventors' Models. John Ruthven, Cincinnati, O.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Best Wood Cutting Machinery, of the latest improved kinds, eminently superior, manufactured by Bentel, Margedant & Co., Hamilton, Ohio, at lowest prices.

Steel Castings true to pattern, of superior strength and durability. Gearing of all kinds. Hydraulic cylinders, crank shafts, cross heads, connecting rods, and machinery castings of every description. For price list and circular, address Chester Steel Castings Company, Evelina St., Philadelphia, Pa.

Diamond Engineer, J. Dickinson, 64 Nassau St., N.Y.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Walrus Leather, Walrus Wheels; all kinds of Polishing Supplies, in quantities to suit. Greene, Tweed & Co., New York.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Safety Linen Hose.—New machinery enables us to offer this Hose lower than ever. Greene, Tweed & Co., New York.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N.Y. Wm. Sellers & Co.

Howard's Bench Vise and Schleuter's Bolt Cutters. Howard Iron Works.

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Electro-Bronzing on Iron. Philadelphia Smelting Company, Philadelphia, Pa.

Excelsior Steel Tube Cleaner. Schuylkill Falls, Phila., Pa.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

Portland Cement—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 53 Broadway, New York.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

Two of the handsomest and best Guns ever brought to this country, but little used, for sale for less than half their cost. One a double-barreled breech-loading shot-gun, and the other a double express rifle. A rare chance to procure two valuable weapons. See advertisement on back page.

"Vick's Floral Guide" contains a colored plate, 500 illustrations, 100 pages, descriptions of the best flowers and vegetables, and how to grow them; all for 5 cents; in English or German. Add. James Vick, Rochester, N.Y.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign cirulation.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

(1) H. L. B. writes: In answer to the query of "H. H. H." in the last SCIENTIFIC AMERICAN, I would inform him that the largest steamboat on the Ohio river, at present, is the Southern Transportation Line steamer, Thomas Sherlock, plying between Cincinnati and New Orleans, which is over 300 feet long, measures 1353·02 tons, and has a capacity for 2,000 tons. She has frequently had 1,500 tons on board, and at one time carried a cargo of 1,850 tons freight up the river. The steamers Robert Mitchell, Charles Morgan, and Guiding Star, of the same line, are each over 300 feet long and carry from 1,600 to 1,800 tons. The stern-wheelers, Golden City and U. P. Schenck, also carry about 1,600 tons. The Cincinnati and Louisville United States Mail Line steamer, United States, is over 300 feet long, but her extremely sharp model prevents her from carrying a large cargo. The largest vessel on the Mississippi is the St. Louis and New Orleans Anchor Line steamer, James Howard, which is 336 feet in length, 56 feet beam, 10 feet hold, and has a capacity for over 3,000 tons freight. The new lower Mississippi steamers, J. M. White, Ed. Richardson, and Henry Frank, are probably the largest cotton carriers in the world, each having a capacity for about 12,000 bales. The most powerful towboat on the western waters, the Joseph B. Williams, has frequently taken over a half million bushels of coal down the Ohio and Mississippi rivers at one time, and in March, 1878, took from Louisville to New Orleans a single tow of 34 barges, containing 601,000 bushels or nearly 22,000 tons of coal, landing it without loss at her destination. The tow and towboat made a monster fleet nearly 900 feet long and covering over 4 acres.

(2) H. H. B. writes: We have a 12x24 cast iron whistle, supplied by a 2 inch pipe 25 feet long. Under a pressure of 70 lbs. steam we do not get the heavy sound the manufacturer expected. Could we benefit it by shortening the supply pipe? A. If you desire a deeper tone lengthen the bell. The thickness of the bell may have some influence on the quality of the tone, but it does not affect the pitch. The difficulty may be in the adjustment of the bell.

(3) B. C. M. asks: 1. Is there any way to prepare paper so that it will be colored by passing a current of electricity through it? A. Saturate the paper with a solution of potassium iodide in ten parts of thin starch water well boiled, and dry; or use a solution of about 3 parts of potassium ferrocyanide in 20 of water. It is best to slightly moisten these papers before using; the latter requires an iron or steel pen or style. 2. Is it possible to adapt a carbon battery, such as is used with Edison's electric pen, so that it can be used for the electric pen described in a recent number of your paper? A. Yes.

(4) F. F. H. asks: How is "gilder's wax" made to color gold? A. Oil, 25 parts; yellow wax, 25 parts; acetate of copper, 13 parts; red ocher, 37 parts. The whole is melted, and stirred until cold.

(5) E. O. D. asks: Will plaster of Paris answer as material for making porous cells for Bunsen batteries? If so, how do such cells compare with those made of fine clay? A. It has been used, but cannot be recommended. Porous clay cells are to be preferred to anything else.

(6) W. H. H. asks: Can you refer me to a good book on refining crude petroleum oil? A. "A Practical Treatise on Coal, Petroleum, and other Distilled Oils," by A. Gesner.

(7) W. B. P. asks: Can rubber be melted and run into moulds like lead or any metal, and get a correct and true copy, such as would do for rubber stamps? A. No; rubber when melted loses its character by partial decomposition, and remains soft and sticky on cooling. Unvulcanized caoutchouc can be softened by a gentle heat, so as to copy a mould when pressed into it. See articles on vulcanized rubber, pp. 48 and 105, vol. 39, SCIENTIFIC AMERICAN SUPPLEMENT.

(8) C. H.—We think MacCord's drawing lessons contained in the SUPPLEMENT will answer your purpose. For drawing materials address dealers who advertise in our columns.

(9) E. C. R. and F. N.—For process of ebonizing wood, see vol. 39, p. 411 (2), SCIENTIFIC AMERICAN.

(10) L. H. L. asks: How much power will a current wheel give, that is 10 feet in diameter, 20 feet long, with the paddles 18 inches deep in the water? A. Multiply the weight of water in pounds passing by the immersed section of the wheel per minute, by the speed at which it moves in feet per minute, and divide the product by 55,000.

(11) J. W. T. asks: 1. Where to obtain latest and best information on the following: How to analyze soils, manures, foods, etc.? A. Fresenius' "Quantitative Analysis," contains full and complete directions for the analysis of soils and manures. There is no work having special reference to the analysis of foods. Consult also, "Agricultural Qualitative and Quantitive Analysis," by G. C. Caldwell. 2. What book or books best suited to assist in gaining a knowledge of agricultural chemistry? A. "Agricultural Chemistry," by James F. W. Johnston, F. C. S., is a most thorough and complete treatise on this subject.

(12) J. D. writes: We desire to know what is the best method for separating gold and platinum filings, our object being to get the gold. A. Cover the scraps with warm aqua regia (nitric acid 1 part, hydrochloric acid 3 parts) and digest for an hour; pour off the solution and repeat the digestion with fresh acid as long as any residue remains undissolved. Evaporate the acid solutions nearly to dryness, dissolve the residue in warm water slightly acidified with hydrochloric acid, and add strong aqueous solution of sal ammoniac in slight excess. Collect the precipitate (ammonium platinum chloride) on a filter, wash it with water, and to the warmed filtrate (with washings) add excess of aqueous solution of copperas (ferrous sulphate). Collect the finely divided gold precipitated, dry, mix it with a few fragments of borax, and melt in a small black lead crucible. Mix the platinum precipitate with a few fragments of zinc and dilute hydrochloric acid, and when all the metal has been precipitated dry, and fuse it in a small shallow lime crucible by means of the oxy-hydrogen blow pipe.

(13) W. S. asks how to groove the edges of the spectacle lenses so as to put in the frame that has no groove? A. Use in a lathe a thin copper disk supplied with emery and water.

(14) X. Y. Z. asks: What will make a good stain (walnut) for pine, poplar, or maple wood? A. Water, 1 quart; washing soda, 1½ oz.; Vandyke brown, 2½ oz.; bichromate of potash, ¼ oz. Boil for 10 minutes, and apply with a brush, in either hot or cold state, diluted with hot water, if necessary.

(15) R. M. asks how a dark color may be imparted to rifle barrels. A. They are generally blued by heat.

(16) R. & Co.—The beetle which you send is the common "larder beetle" (*Dermestes lardarius*). It was the larva of this insect that committed the depredations of which you complain. Professor C. V. Riley recommends the sprinkling of fabrics with benzine occasionally as a remedy against the incursions of this pest.

(17) F. G. D.—For bells use copper 77, tin 23. Use borax as a flux. Pour quite hot. For the mould use the sand as dry as possible. Bells injured by cooling too quickly may be tempered by reheating them and allowing them to cool slowly.

(18) G. W. D. writes: I have a water wheel 10 feet in diameter giving me ten horse power. How much power will I get from a wheel 20 feet in diameter? The stream of water is sufficiently large for either. A friend claims that the power will be exactly doubled, which I doubt. A. It is possible to double the power with the new wheel, if you have abundance of water. You can effect the same result with the present wheel, however, by running it faster.

(19) "Reader" asks about what length of time a sheet of boiler iron three thirty-seconds inch in thickness will last in the ground before it will rust through. Also what length will it last with three coats of pitch? A. From 1 to 5 years, according to the nature of the ground. If well coated with pitch, it will last an indefinite period.

(20) T. C. C. asks: 1. What can I use to fill the pores of walnut to prepare it for varnish, and how is it applied? A. Apply several coats of alcoholic shellac varnish, and when dry rub them down with moistened pumice powder. 2. What kind of varnish is best? A. Clear copal varnish gives a fine finish. 3. How is veneering done? A. Moisten one side of the veneer with warm water, coat the other with hot glue, apply the glued side to the surface to be veneered, and clamp securely in position until the glue has set. If not sufficiently moistened on the reverse side the veneer will curl so that it cannot be smoothly applied.

(21) L. A. B. writes: 1. I am making some curved rulers of hard maple from patterns in the SUPPLEMENT. What can I soak them in to make them tough and hard? A. Soak them for about 24 hours in a strong aqueous solution of lead or aluminum acetate, and then for several hours in warm solution of soap in 48 per cent alcohol. Wash with water and dry slowly. 2. Do artists in drawing use a rest for the hand or arm, or are they entirely free from the paper? A. A rest is used for some kinds of work.

(22) F. A. W. asks how to make red impression paper, suitable for marking fretwork patterns on black water. A. Rub into a suitable tissue a mixture of 6 parts of lard, 1 part of beeswax, and a sufficient quantity. Venetian red, red lead, or vermilion, in very fine powder. The mixture should be warm, and should not be applied in excess.

(23) H. G. O. asks for the most efficient method of putting a white coating on brass, with block tin, commonly known as "white washing." A. Boil together 6 lbs. cream of tartar, 4 gallons of water and 8 lbs. of grain tin or tin shavings for half an hour in a porcelain lined vessel; put the clean brass ware in the boiling liquid for a few minutes or until properly coated. A boiling solution of potassium or sodium stannate mixed with tin turnings may be employed instead of the above.

(24) C. W. F. asks: How can I clean 10 or 12 lbs. of mercury of mechanical impurities, otherwise than by distilling? A. Pierce the apex of a dry filter (cornet) with a pin point, adjust the paper accurately to a funnel, and gently pour in the mercury. If the mercury is dry and the impurities are purely mechanical it will rarely be necessary to repeat the filtration. The metal may be freed from gross impurities by passing it through a piece of chamois skin free from holes.

(25) S. D. M. writes: 1. The expression of a horse power is 33,000 lbs. raised 1 foot high in 1 minute. What is the expression of a two horse power? A. 66,000 foot pounds per minute. 2. Theoretically will the principle of the hydrostatic press remain the same if air be substituted for water? A. Yes. 3. By increasing the blast through a blow pipe, the heating effect where the flame impinges is augmented. Does an increase in the combustion of the spirits take place, or is it entirely accounted for by the increase of oxygen in the blast? A. The temperature is augmented through the more rapid oxidizement of the combustible. The blast also mechanically concentrates and impels the highly ignited gas against the object to be heated. An excess of blast, however, cools or extinguishes the flame. 4. Is there a good pocket book on mechanical engineering published, similar in character to those used by civil engineers in their profession? A. There are several, Nystrom's, Spon's, and others.

(26) H. F. D. asks: Do plants make air pure or impure in a room? A. It depends somewhat upon the character of the plants, and their number. If the plants are few in number and the apartment is properly ventilated, ordinarily no danger need be apprehended. 2. Does zinc get harder to melt the more you melt it? If so, why? A. No. 3. What is the best mould made of to cast lead in? A. A well dried plaster of Paris mould does very well for small castings. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 17. 4. Would a steam engine of ¼ horse power be sufficient to run a sewing machine or turning lathe? A. Yes.

(27) "Old Subscriber" asks: What coating or varnish can I use to make *papier mache* fireproof? A. Apply a hot saturated aqueous solution of commercial tungstate of soda or of waterglass. Repeat the application several times.

(28) F. G. P. asks if there are any chemicals that would act like a loadstone. A. No; several of the compounds of iron besides magnetite are magnetic, but the property is not sufficiently marked in any of these to satisfy your requirements. Have you tried small steel magnets or magnetized needles? See "Phil. Trans.," 1855 and 1856, also "Watts's Dictionary of Chemistry," vol. iii. p. 776.

(29) "Reader" asks: What will remove the crust from the inside of a boiler? It collects on the flues almost half an inch thick. A. The use of fresh water is the most ready means of removal, though there are some patented compounds in the market that are well spoken of.

(30) H. L. S., referring to the electric pen described in our issue of February 22, states that there is no need that the writing slab of metal should be insulated; and if well connected with the ground, and one of the poles of the coil, it may be handled with impunity while the coil is working. The sparks will now pass quite as well from the stylus connected with the other pole, as though the metal plate on which the paper rested was insulated.

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(31) J. R. D. asks: 1. Can ordinary paraffine, such as is used in making so-called wax candles, be dissolved by heat or made to fuse with boiled linseed oil, and if so fused will it remain? What will dissolve the same, and how can it be made into a liquid or semi-liquid form and remain in that form? A. Stir the paraffine into the hot oil—this will afford an emulsion, if not a true solution. Paraffine is quite soluble in benzole. 2. What is the substance used in making the gloss on rubber shoes? A. A benzole solution of asphaltum and caoutchouc is used, we believe.

(32) A. L. S. asks: 1. Would a Leclanche battery with a proper induction coil give a spark the required length for an electric pen? A. Yes, but it is hardly constant enough for continued use. 2. How large a coil should I need? A. A coil that will yield an eight inch spark will do. For full directions for making induction coils, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 160.

(33) J. L. C. writes: With feed water at a temperature of 208°, I am burning 142,000 lbs. of coal in a given time. What per cent of fuel can I save if I increase the temperature of feed water to 225°, the increase of temperature to be effected by conveying the water through pipes located at or near base of chimney, or flue leading to same? A. One and seven tenths per cent nearly.

(34) D. P., Jr., writes: We have a 36 inch crosscut circular saw which is geared as follows: line shaft 240 revolutions to minute, 32 inch pulley on line shaft running on 12 inch pulley on counters, 18 inch pulley on counter connecting with 11½ inch pulley on mandrel. We think this should give the saw a speed of 1001 revolutions, but it evidently has not that speed. Is the fault in the counter pulleys being too small? We have tried working tight belts, yet the desired speed is not attained. A. If there be no slip to your belts you should obtain the speed named, but the first pair of pulleys are small for their work, and the slip is probably 5 to 8 per cent. Substitute a 34 or 36 inch pulley for your 32 inch one.

(35) F. A. S. asks: 1. Is it a fact that building paper is merely a nest for rats, mice, and various pestiferous vermin? A. No; when of sufficient thickness, and well lapped and nailed at the joinings, it is beneficial in keeping a house warm. 2. Do you know of any way of using battens, in the construction of a cottage, and still make the building as warm as if siding were used? A. Yes; by tonguing and grooving the boards, and driving them tight together, before covering the joint with the batten. 3. Is a house, framed as is the custom when battens are used, rigid enough for this climate? A. Yes, if the posts and studs are placed close enough together and well braced. More studs, of course, should be placed on the sides of the house that support the ends of the floor beams, than there need be in the front and rear. 4. Is there any way of preventing the battens from warping, or in case they do lose their shape, exclude the air from the house? A. Make them quite narrow and nail them well. Should any battens show a tendency to warp and spring loose, secure them again with screw nails driven with the hammer.

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MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

R. G.—A test of the sample revealed neither gold nor silver; it is a piece of red sandstone containing a small quantity of lime carbonate.—E. A. M.—It is not a meteorite, but marcasite embedded in quartz. The brown coloration is due to the conversion of ferric sulphide into ferric oxide.—T. B. F.—No. 1 is a weathered sedimentary rock, consisting principally of aluminous silicate, lime, and oxide of iron. No. 2 is limonite—hydrous iron sesquioxide—aniron ore. No. 3 contains magnetic and ferric sulphides.—J. V. R.—No. 1 is orthoclase. No. 2, chert. No. 3, serpentine or greenstone. None of these are of value. We cannot judge of the possible mineral value of the properties from the samples.—J. K. B.—No. 1. Chalcocite or copper glance—when pure composed of copper 79·8, sulphur, 20·2. No. 2. It contains altered serpentine, quartz, and ferropyrite. No. 3. Calcite—crystallized calcium carbonate—with serpentine. No. 1 may be of some value.—C. S. W.—The substance consists of iron oxide and black oxide of manganese—the latter is of some commercial value.—W. R. R.—The small fragments consist chiefly of iron sulphide. It contains traces of gold. Some of this ore may prove of value.—W. B. M.—It is mica schist of no value.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 11, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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Wedge for splitting logs, L. F. Johnston 212,230
Wells, packer for oil, O. B. Latham (r) 8,573, 8,574
Whiffletree hook, A. Smith 212,276
Whip socket, H. W. C. Thomas 212,119
Wind engine, J. C. Kuempel 212,236
Windwheel, Mider & McClelland 212,249
Window screen, M. H. Smith 212,277
Wire manufacture, flanged, W. J. Lewis 212,239
Wooden block coater, C. M. Hyatt 212,229

TRADE MARKS.

Bacon, hams, and cured and pickled meats, S. Dally 7,017
Boot and shoe blacking, H. St. John 7,028
Bourbon and rye whiskies, Pepper & Adams 7,013
Buttons, A. & D. Flesh 7,018
Cigars, M. Ephraim 7,016
Clocks, Ansonia Clock Company 7,015
Cologne water, J. M. Farina 7,020
Essences of meat, London Manufacturing Company 7,021
Export tables, B. Weber 7,019
Flour, H. H. Swift & Co 7,026, 7,027
Flour, Imbs, Meyer & Co 7,012
Lager beer and ale, F. Hollender 7,025
Leather, hides, skins, etc., A. Waring & Co 7,030
Medicinal compound for cure of consumption, etc., M. C. White 7,029
Pills, Carter Medicine Company 7,023, 7,024
Scales, Buffalo Scale Company 7,022
Whisky, C. Rebstock & Co 7,014

DESIGNS.

Carpet pattern, A. Heald 11,022
Cuff, J. M. Ide 11,019
Pedestal and front of a clock, H. R. Frisbie 11,020, 11,021
Standing collar, G. P. Ide 11,018

English Patents Issued to Americans.

From February 7 to February 14, inclusive.

Boiler furnace.—T. Murphy, Detroit, Mich.
Clocks.—W. Lyndon, Brooklyn, N. Y.
Drilling machinery.—J. W. Harrison *et al.*, Wayne, Mich.
Furnace.—D. M. Thomas, Detroit, Mich.
Furnace rate.—T. Murphy, Detroit, Mich.
Lamp.—C. F. A. Hinrichs, Brooklyn, N. Y.
Lamp.—A. Coombs, Philadelphia, Pa.
Glass, manufacture of.—R. M. Atwater, Millville, N. J.
Glass surfaces, treatment of.—W. Gibson, Washington, D. C.
Motive power.—L. A. Aspinwall, Albany, N. Y.
Mould for casting steel.—G. Cowing, Cleveland, Ohio.
Organ pedals.—Wilcox & White Organ Company, W. Meriden, Conn.
Paper feeding device.—C. Ellery, Albany, N. Y.
Piston packing.—A. Vivarttas *et al.*, New York city.
Roller mills.—W. D. Gray, Milwaukee, Wis.
Sewing machine.—S. Rockwell, Baltimore, Md.
Sewing machine.—C. H. Wilcox, New York city.
Shoe fastening.—E. Rees, Merced, Cal.
Shoe lacing stud.—M. Bray, Newton, Mass.
Tiles, framing of.—C. A. Wellington, Boston, Mass.

Advertisements.

Inside Page, each insertion ---75 cents a line.
Back Page, each insertion ---$1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

WANTED.—AN EXPERIENCED MECHANICAL Engineer and Machinist wishes to make engagement with a reliable firm as Superintendent or Head Draughtsman. Good references. Thorough Steam Engineer. Address B. L, 101, N. W. AYER & SON, Phila.

Auction Sale of Valuable Machinery.

The property well and favorably known as Hardie's Machine Works, 62 and 64 Church St., Albany, N. Y., will be sold March 26th at noon. Send for circulars to above address.

THOMAS'S CONCENTRATED DYE Stuffs. (138 Recipes SENT GRATIS.) (See SCIENTIFIC AMERICAN SUPPLEMENT, March 15, '79. Address N. SPENCER THOMAS, Elmira, N.Y.

A Rare Opportunity, on Easy Terms.

To be sold at Auction, at Charleston, South Carolina, on Tuesday, the first day of April, 1879, the Taylor Iron Works, complete and in operation, together with all stores, stock, and work on hand on day of sale.

The above is a large, first-class engineering establishment, complete within itself for all kinds of work, comprising iron and brass foundries, boiler shop, machine shops, pattern and millwright shops, with a large stock of patterns for local machinery, and Taylor presses. Connected with the works is a large, well-stocked engineer and mill supply store. All departments have the best of modern tools in thorough repair. Buildings comparatively new, and conveniently arranged on large grounds. The business was established 1844; has always done a large business and maintained a high reputation. The present works, built since 1866, have ample facilities to work 200 men. At present about 100 men are employed. For further particulars apply to the works or to JOHN F. TAYLOR, Sharon Springs, N. Y., who will meet parties at Albany, N. Y., by appointment, or New York, if preferred.

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Mfrs. of Hand and Power Bolt and Pipe Cutters, Bolt Pointers, Bolt Headers, Hot and Cold Pressed Nut Machinery, Taps and Dies, etc. Send for Cir. Cleveland, O.

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of Plays, Dramas, Comedies, Farces, Ethiopian Dramas, Plays for Ladies only, Plays for Gentlemen only. Wigs, Beards, Moustaches, Face Preparations, Burnt Cork, Jarley's Wax Works, Tableaux, Charades, Pantomimes, Guides to the Stage, and for Amateurs Make up Book. Make up Boxes, New Plays. SAM'L FRENCH & SON, 38 East 14th St., Union Square, New York.
Catalogues sent FREE!!!

50 *Latest Style* **CARDS**, *Bouquet, Lawn, Floral*, etc., in case, *name in gold*, 10c. SEAVY BROS., Northford, Ct.

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To make money fast operating in stocks, is to secure steady gains from the daily variations in prices, as they occur, without waiting to incur the sweeping risks of sudden and extreme fluctuations. In this way the business becomes as safe and desirable as any mercantile, manufacturing, agricultural, or professional pursuit, while a good profit can be made on either a bull or a bear market. By the Mutual Capitalization System, each operator receives all the advantages of unlimited capital, united with the best skill, whether the investment be great or small, and large profits are returned, which would be impossible to obtain in any other way. All conflicting interests are harmonized, while the immense weight of ready cash capital forces success. Anybody can operate successfully by this method, and profits are divided among shareholders every 30 days. $50 will earn $300; $500 will make $2,500; $1,000 will return $7,500, and so on, as the market moves. The public and patrons universally indorse this as the most successful method of operating in stocks ever introduced. New circular, with unfailing "Rules for Success," and much information of absolute importance to all operators, mailed free. All kinds of Stocks and Bonds wanted. Government Bonds supplied. Apply to
ADAMS, BROWN & CO.,
Bankers and Brokers, 26 & 28 Broad St., N. Y. City.

60 Chromo and Perfumed Cards [no 3 alike], Name in Gold and Jet, 10c. CLINTON BROS., Clintonville, Ct.

CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is $75; German, $100; French, $100; Belgian, $100; Canadian, $50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free.

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Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.
BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

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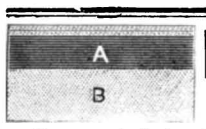

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BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

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A pipe made from leaf tobacco, 15c; $1.25 a dozen. O. K. window cleaners, 7½ inches, 25c.; 9 inches, 35c.; 12 inches, 45c. Steel watch chains, 15c., new designs. Lloyd combination pen and pencil, 25c.; $1.75 doz. A good bracket saw, 15c.; $1.00 a dozen. A first-class pearl handle four-bladed knife, 60c. A black handle bristle shaving brush, 15c.; $1.00 a dozen. Nickel plated match boxes, 12c., 18c., 20c., and 25c. All these goods sent, postpaid, on receipt of price. Send stamp for catalogue.

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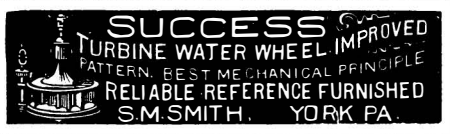
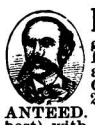
NEW HAVEN, CONN.





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NOTICE TO MACHINISTS.

RICHMOND, VA., February 28, 1879.
Proposals are invited until JULY 1, 1879, for furnishing the BEST DESIGNS of NEW PUMPING MACHINERY for the Richmond, Va., Water Works, for which premiums will be paid as follows:
1st best design, $500; 2d best, $300; 3d best, $200.
The committee of the City Council reserves the right to reject any and all designs.
For particulars, address the undersigned,
W. E. CUTSHAW, City Engineer.

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BEST STEAM PUMP, FOR ALL PURPOSES.
Brooklyn, E. D., New York.

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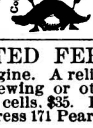

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A Wonderful Discovery. Forces heavy Moustache or Beard even on smooth faces in from 20 to 30 days. These cuts are from the original, and show a positive result from its use. It works like magic and never fails. No possible injury to the skin, easily applied and certain in effect. Pkg. post-paid 25cts. 3 for 50cts. L. L. SMITH & CO. Bob Ag'ts, Pals ine, Ill. All others counterfeit.

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WHEELER'S PATENT WOOD FILLER
fills the pores of wood perfectly, so that a smooth finish is obtained, with one coat of varnish. Send for circular. Mention this paper. BRIDGEPORT WOOD FINISHING CO., 196 Mercer Street, New York.

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MILLIONS IN IT!
In what? In the facts, principles, and arguments of this little book. *For whom?* For Mill owners, Manufacturers, and their work people. "THE STRIKE AT TIVOL MILLS AND WHAT CAME OF IT." By T. S. ARTHUR. *Price 25 cents by mail.*
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Fine Pamphlets printed for **75c. a Page**
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"Local" Printing House, Silver Creek, N. Y.

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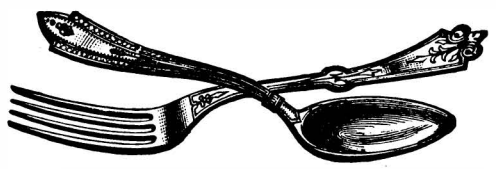
A $6.00 NEW YEAR'S GIFT
—OF—
COIN-SILVER TABLEWARE
Given Away



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An Elegant Set of Warranted Extra Coin-Silver Plated TEA-SPOONS that retails at $4.50 per Set, and an Elegant Extra Coin-Silver Plated BUTTER-KNIFE that retails at $1.50, and one Elegant FIVE-BOTTLE CASTER that retails at $7.00, thus making a valuable and useful Gift, that all should receive at once.

Under a very favorable proposition from the old established and reliable **Eagle Gold and Silver Plating Co.**, Cincinnati, O., you will be supplied with this valuable Silver Tableware as a New-Year's Gift. This **elegant set** of

SILVER TEASPOONS AND BUTTER-KNIFE

are of the latest style pattern, and **each article is to be engraved with your name or initials,** if desired, **FREE,** thus making the most useful and beautiful Gift ever presented. Don't neglect to send your initial or name with orders to be engraved.

Cut out the following order and send it to the **Eagle Gold and Silver Plating Co.,** at Cincinnati, for redemption, together with sufficient to pay boxing, packing, postage, or express charges. **This Silverware is to cost you nothing,** except the packing, postage, or express charges, (which is one dollar,) which you are required to send, and the Silverware is then

DELIVERED TO YOU FREE.

☞ Please cut out the following New-Year's Gift Silverware Order, and send same to **Eagle Gold and Silver Plating Co.,** 180 Elm Street, Cincinnati, Ohio.

☞ *Cut Out this Order, as it is worth $6.00.* ☜

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On receipt of this order and **$1.00,** to pay postage, packing, or express charges, we will mail you FREE one Set of Extra Coin-Silver Plated Teaspoons worth $4.50, also one Elegant Butter-Knife worth $1.50, with your monogram initial engraved upon same in good style—thus making the Elegant Set of $6.00

TEASPOONS AND BUTTER-KNIFE

a valuable and useful FREE New-Year's Gift to you. Send for Silverware **at once,** together with **$1.00,** stating name in full, with post-office, county, and State.

Address all orders to **EAGLE GOLD AND SILVER PLATING CO.,**
180 Elm Street, CINCINNATI, OHIO.

Cut out the above order, so that we may know you are entitled to it, and send for the Gift at once, together with **One Dollar** to pay postage and packing charges, so that the articles can be delivered to you **free of any expense.**

Address, **Eagle Gold and Silver Plating Co., 180 Elm St., Cincinnati, O.**

OUR NEW-YEARS GIFT.

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Passenger and Freight Elevators,
STEAM ENGINES AND BOILERS,
WHITTIER MACHINE CO., Boston, Mass.

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Established in 1840.

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2	3½x4	48 in.	40x25	900	$150
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Also, SPARK ARRESTING PORTABLES, *and* Stationary Engines *for Plantations.* Send for Circulars.

$7 A DAY to Agents canvassing for the **Fireside Visitor.** Terms and Outfit Free. Address P. O. VICKERY, Augusta, Maine.

MACHINIST GOODS
And Small Tools of all kinds. Catalogues sent free.
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RIVAL STEAM PUMPS. JOHN H. McGOWAN & Co $35. & UPWARDS CINCINNATI OHIO.

Soft, Strong, and Smooth Iron or Brass **CASTINGS** Plain, Galvanized, Bronzed or Nickled to order promptly.
Also patterns and models. Light work a specialty.
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FOR SALE—A patent Fan Attachment for Sewing Machines; also, a patent arrangement for drawing Mosquito Bars. For particulars, address I. A. Abbot, Natchez, Miss.

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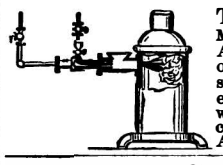

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Cincinnati Industrial Exposition

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ERECTED FOR THE PURPOSE.

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Send for Rules and Premium Lists after April 1.

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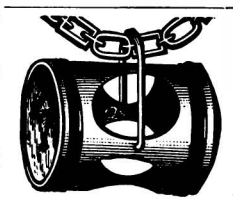

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Boiler Tubes, Steam Pipe, Light and Heavy Forgings, Engines, Boilers, Cotton Presses, Rolling Mill and Blast Furnace Work.
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HENRY R. WORTHINGTON,
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THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.
STEAM PUMPS—Duplex and Single Cylinder.

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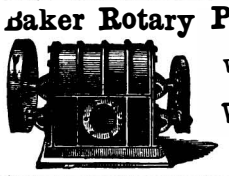
ROOF PAINTING. For $5, by Post Office Order or express, I will send the recipe for making Langhorne's English Gum Coating Paint and other mineral paints, with full instructions for roof and sidewall painting. This paint is used by the U. S. Government. Address M. LANGHORNE,
708 E Street, Washington, D. C.

FOR SALE.—LETTERS PATENT OF Wilhide's Celebrated Noiseless Self-setting Rat and Mouse Traps. Thoroughly introduced. Traps sold by all dealers. Address Owners and Manufacturers,
J. T. WILHIDE & BRO., York Road, Carroll Co., Md.

Baker Rotary Pressure Blower.



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Warranted superior to any other.
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All Strong Plants, each labeled, delivered safely by mail. **Largest assortment. Low prices.** In business 25 years. *Guarantee satisfaction.* Stock comprises *all desirable varieties.* Only mature plants sent. Our new **Illustrated Hand-Book,** sent free, contains name and description of each plant, with instructions for successful cultivation. *Do not purchase Plants* **elsewhere** *before sending for our new* **HAND-BOOK** Every lover of *flowers* should have it. All buyers of *cheap plants* should have it. Every one wanting *new* and *choice plants* should send for our *Hand-Book.* HOOPES, BROTHER & THOMAS,
CHERRY HILL NURSERIES, West Chester, Pa.

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Moss' Process.
Photo Engraving Co.
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L. SMITH HOBART, President. JOHN C. MOSS, Superintendent.

TYPE-METAL RELIEF PLATES.
A SUPERIOR SUBSTITUTE FOR WOOD-CUTS
AT MUCH LOWER PRICES.

Persons desiring illustrations for Books, Newspapers, Catalogues, Advertisements, or for any other purposes, can have their work done by us promptly and in the best style.

Our Relief Plates are engraved by photo-chemical means; are mounted on blocks type-high ready for use on any ordinary press, and will wear longer than the common stereotype plates.

They have a perfectly smooth printing surface, and the lines are *as deep, as even,* and *as sharp* as they could possibly be cut by hand.

Electrotypes may be made from them in the same manner as from wood-cuts.

Copy. The engraving is done either from prints or pen-drawings. Almost all kinds of prints can be re-engraved directly from the copy, provided they be in *clear, black lines* or stipple, and on *white* or only slightly tinted paper.

Pen drawings, suitable for engraving by us, must be made with *thoroughly* BLACK ink, on *smooth, white* paper. They should usually be made twice the length and twice the width of the plates desired.

When such drawings cannot be furnished us, we can produce them from photographs, pencil sketches, or designs of any kind accompanied with proper instructions. Photographs taken in the usual way, and of any convenient size, we can use.

Change of Size.—Wood-cut prints of the coarser kind may often be reduced to half their lineal dimensions, while others will admit of very little reduction, and some of none at all.

Most lithographic and steel-plate prints will admit of no reduction.

Very fine prints of any kind may be *enlarged* moderately without detriment.

Any prints which cannot be satisfactorily reduced or enlarged may be *redrawn* and thus brought to any desired size.

In all cases of reduction and enlargement, the relative proportions remain unchanged.

Proofs.—Whenever desired, we will furnish tintype proofs of the drawings made by us, for approval or correction, before engraving. A printed proof is furnished with each plate.

Time.—We cannot usually engage to fill an order for a single plate in less than from three to six days; larger orders will require longer time.

Estimates will be promptly furnished when desired. That these may be definite and correct, the copy to be used—whether print, photograph, sketch, or drawing—should always be submitted for our examination, together with a distinct statement of the size of plate wanted, and of any other details to be observed.

Terms.—To insure attention, all orders must be accompanied by an advance of half the price charged, the balance to be paid on delivery.

Electrotyping and Printing.—We have recently added to our establishment excellent facilities for making electrotypes, and also three power presses specially fitted for printing plates of all sizes in the finest manner.

Artificial Light.—We have just introduced this most important facility, which enables us to prosecute our work *in cloudy weather,* and to push forward hurried orders *in the night.*

References.—Our plates are now used by the principal publishers in this city, and by most of the leading houses in every State in the Union.

Our General Circular contains a few specimens of the various kinds of our work, and will be sent on receipt of stamp. We have just prepared five special circulars, as follows:

No. 1. Portraits and Figures.
" 2. Buildings and Landscapes.
" 3. Machinery and Apparatus.
" 4. Maps, Autographs, and Ornamental Lettering.
" 5. Reproductions from Wood-Cuts, Steel-Plate Prints, and Lithographs.

These will be furnished at *ten cents* each.

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STILES & PARKER PRESS CO., Middletown, Ct.

TO LARGE CONSUMERS OF FINE LIGHT **Malleable Iron Castings,** we can offer special inducements in the way of VERY SUPERIOR QUALITY GUARANTEED, and at fair prices. Being ourselves large consumers and requiring the most perfect castings, other work is insured the same attention.
MALLORY, WHEELER & CO.,
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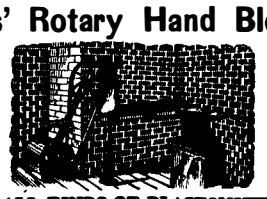

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HENRY B. HYDE, President.
For the Year Ending December 31, 1878.

AMOUNT OF LEDGER ASSETS, JAN. 1, 1878	$32,477,991 87
Less Depreciation in Government Bonds, and Appropriation to meet any depreciation in other assets	369,553 27
	32,108,438 60
INCOME	8,217,943 24
	$40,326,381 84

DISBURSEMENTS.

Paid Policy Holders for Claims by Death, Dividends, Surrender Values, Discounted and Matured Endowments and Annuities	4,935,171 43
Other Disbursements as per extended statement	1,195,841 88
NET CASH ASSETS, December 31, 1878	$34,195,368 53

ASSETS.

Bonds and Mortgages	$12,437,584 93
Real Estate	6,734,904 96
United States Stocks	5,638,768 54
State, City, and other Stocks authorized by the Laws of the State	6,201,978 16
Loans secured by United States and other Stocks	928,000 00
Cash and other Ledger Assets as per extended statement	2,154,131 94
	$34,195,368 53
Market Value of Stocks over Cost	129,796 41
Accrued Interest, Rents, and Premiums, as per extended statement	1,128,927 42
Total Assets, Dec. 31, 1878	**$35,454,092 36**
TOTAL LIABILITIES, including legal reserve for reinsurance of all existing policies	28,560,268 00
Total Undivided Surplus	**$6,893,824 36**

Risks assumed in 1878, 6,115 Policies, assuring $21,440,213 00.
N.B.—For the details of the above statement, see the Society's "Circular to Policy Holders," and other publications for 1879.
JAMES W. ALEXANDER, Vice-President.
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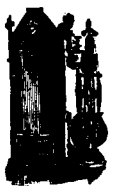
WM. A. HARRIS, Proprietor.



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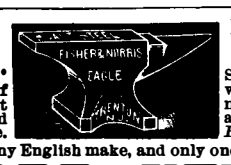

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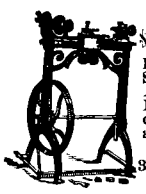

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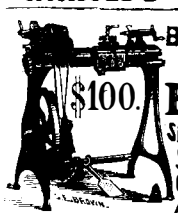

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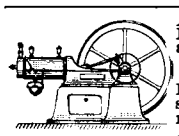

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